STEEL
The Metalworking Weekly
MAY 8, 1961

Hot power spinning of molybdenum rocket skirts is one example of the . . .

New Uses for Refractory Metals 115

Foundries Fight to Cure Economic Ills . . 71

PROGRAM FOR MANAGEMENT

What You Can Do about Depreciation . . . 81

Columbium Steels Win Acceptance . . . 157

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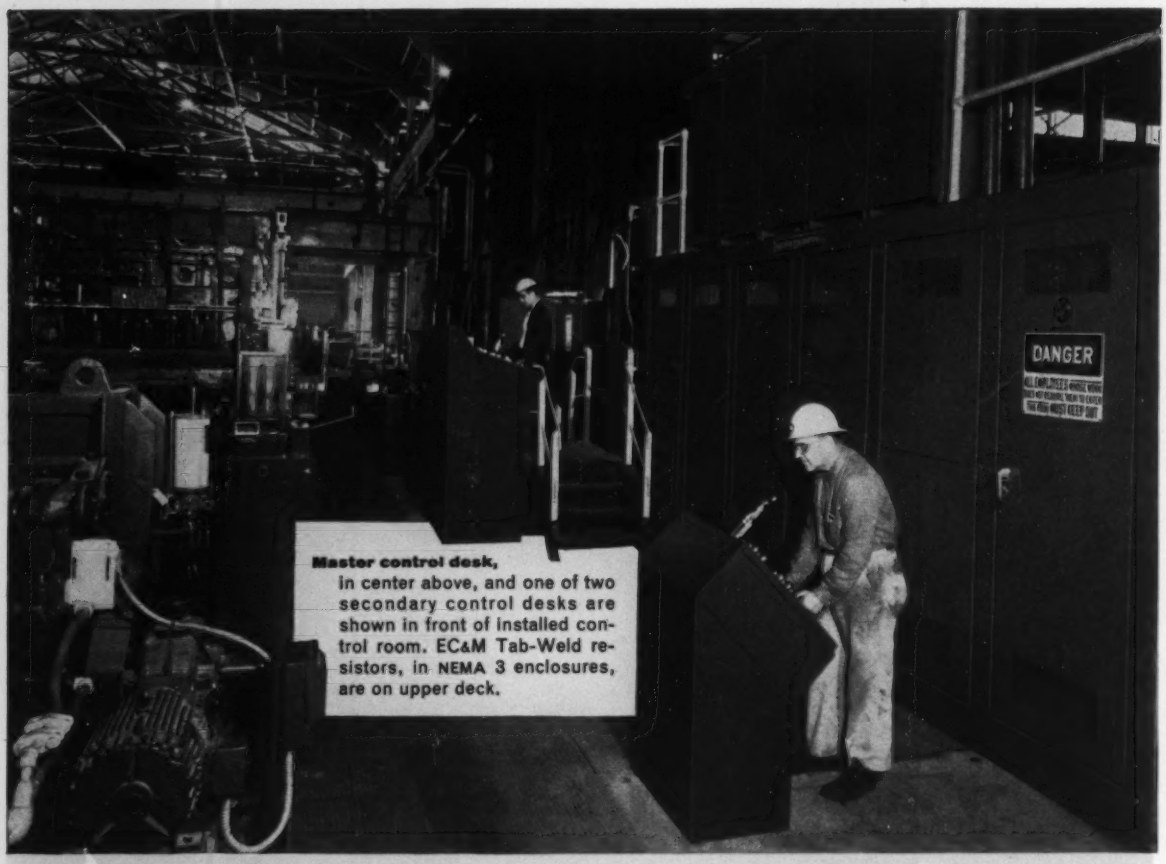

Master control desk, in center above, and one of two secondary control desks are shown in front of installed control room. EC&M Tab-Weld resistors, in NEMA 3 enclosures, are on upper deck.

14-ton Mill-Line Control Room cuts installation time IN HALF!..

Ready for shipment after final test at EC&M plant.

Interior view shows DC main drive contactors at left and motor control centers at right. Framework is of heavy structural design, with 4-way safety pattern deck plates.

• This giant control room, built by EC&M for a coil welding line in a major steel mill, was installed and ready for operation in half the time usually required. Completely pre-wired and interconnected, the packaged unit eliminated the four to five weeks of installation time normally required for wiring and testing. At the mill site, the control room was placed over an open pit which already contained power cables and control wiring.

The control room measures 8 feet wide, 21 feet long and 14 feet high. It contains all the control panels for operating the DC main drives, AC auxiliary drives, and for supplying low voltage DC power for jogging and threading.

For any mill drive, EC&M can design and build a control room which will save space, drastically cut installation time and trouble, and get your drive in operation faster.

Write for details • *Square D Company, EC&M Division, 4500 Lee Road, Cleveland 28, Ohio*

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EC&M DIVISION • CLEVELAND 28, OHIO

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5484

There's one best way to make parts like this...

After forging, this hollow flanged cylinder (9 in. high) was sectioned as shown here. Then the section was polished, etched, and dyed to prove the "flow lines" of the hot-worked steel. Notice how they follow the contours of the forging, adding strength where it is needed most. This forging's greatest advantage: no machining is required in the cavity nor on the OD of the body.

Steel forgings have all these advantages:

Maximum strength per pound of steel
Low overall cost
High resistance to impact
Minimum machining time
Freedom of design
Elimination of fabricating operations
Uniform response to heat treatment
Long service life

Steel

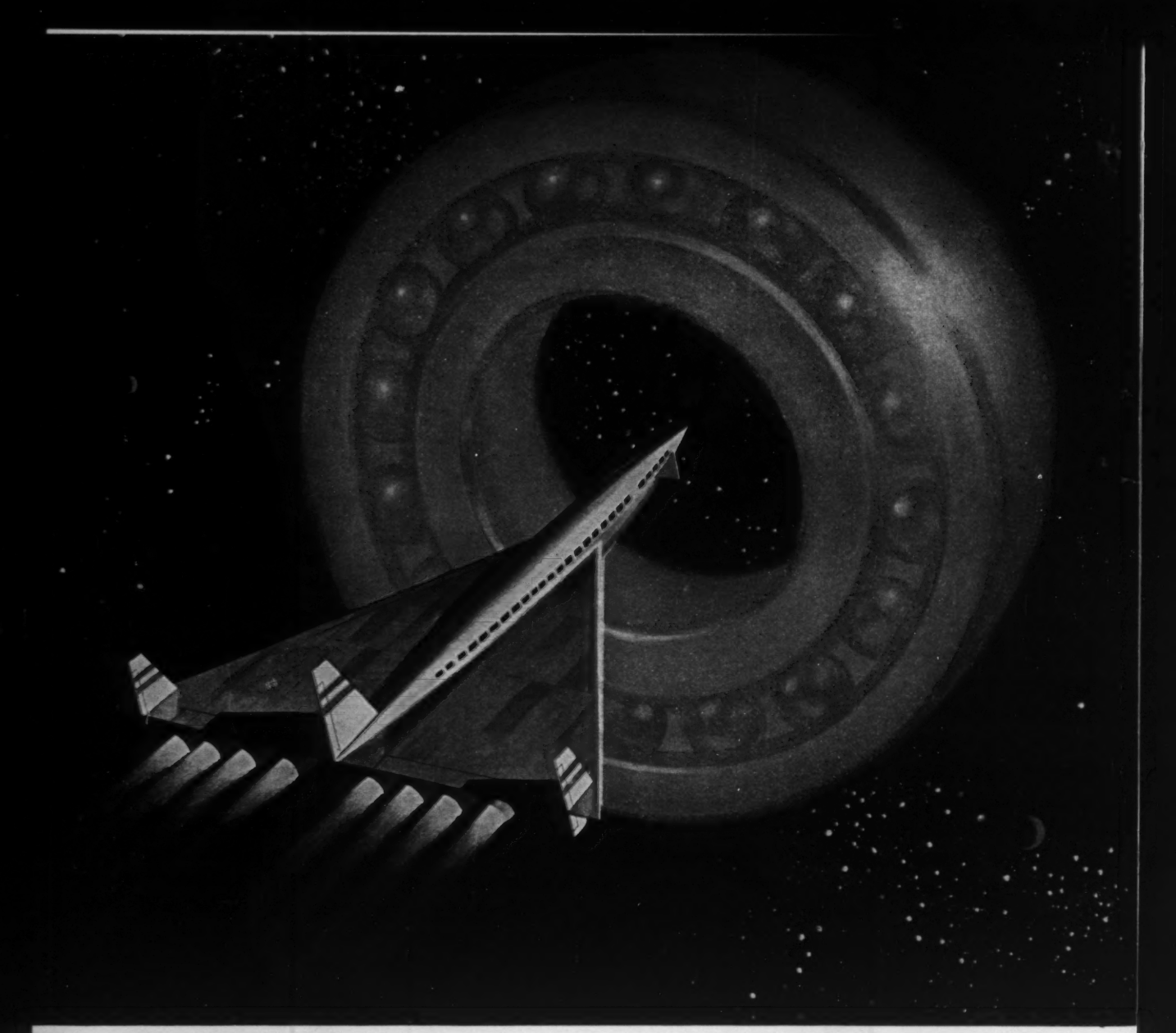
for Strength
. . . Economy
. . . Versatility

Your forgings supplier can tell you in detail just how these advantages can lower your costs and improve the quality of parts. Another thing he knows: **the quality of the steel is the forging's most important ingredient.** That's why so many forgers use Bethlehem steels—carbon and alloy bars they can rely on to satisfy the most demanding requirements.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



BEARING WITH A RED HOT FUTURE

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

On special test equipment in SKF's research laboratory, experimental ball and roller bearings are run at temperatures up to 1000° F and above—conditions under which steel becomes red hot and loses its strength, while conventional lubricants burn or boil away. To meet these problems, bearings made of special heat-resisting alloys and exotic new materials are tested and evaluated. New ideas in design and new approaches to lubrication are constantly being investigated.

Bearings to resist extremely high temperatures are needed for improved, high performance jet engines, gas turbines and other equipment. Special SKF bearings have been tested successfully in environments at about 1000° F. Under certain conditions of operation, much higher temperatures are practical.

Research like this is your assurance that SKF will always keep pace with demands for the highest possible performance in all major types of rolling contact bearings —ball, cylindrical roller, spherical roller, tapered roller and precision miniature. SKF Industries Inc., Philadelphia 32, Pa.

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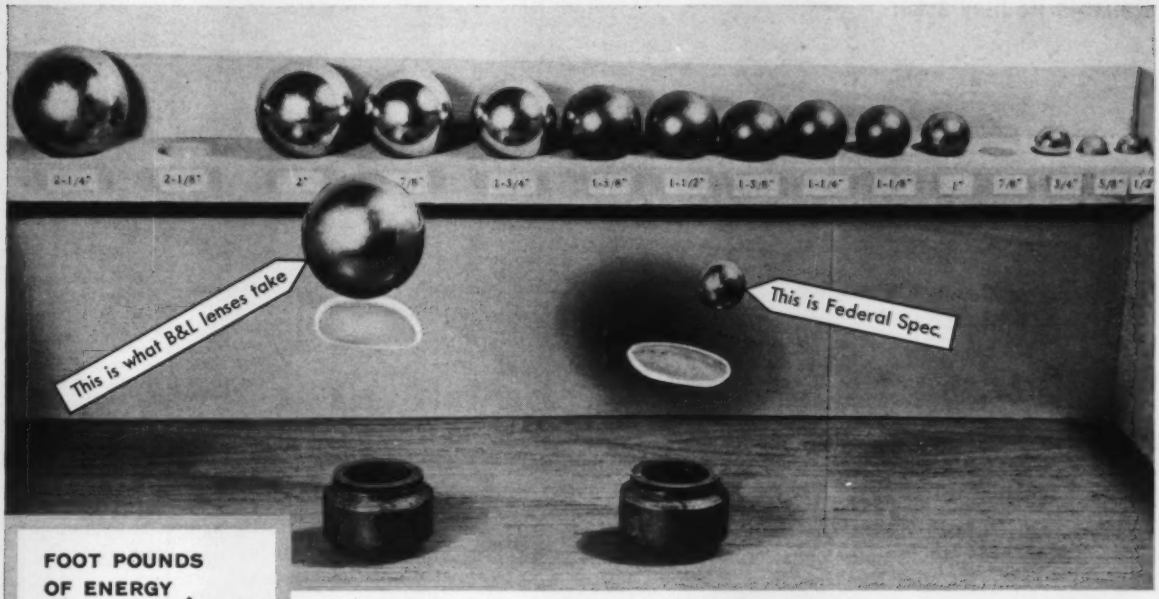

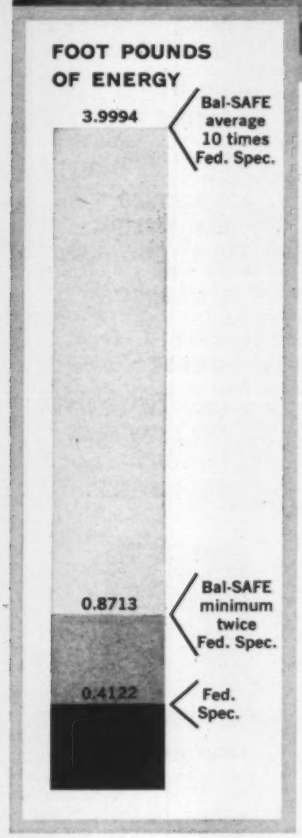

GET *at least* TWICE THE EYE SAFETY YOU PAY FOR

Bausch & Lomb Bal-SAFE lenses twice as tough as Federal Standard

In the picture above, you see two bouncing steel balls stopped in mid-air by the high speed camera. The balls were dropped simultaneously from a height of more than 4 feet. Federal Standards Bureau specification for safety lens impact resistance requires exactly this test, using the 7/8" diameter steel ball you see on the right. Truth is, B&L Bal-SAFE lenses withstand impact from 2 to 10 times greater than Federal specification.

By B&L standards, every lens must withstand the shock of a 1⅛" diameter steel ball, or twice the impact of the 7/8" ball. This extra safety is engineered through a special B&L lens toughening process that adds *not a penny of extra cost to you.*

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A representative from one of the 314 suppliers of B&L Safety Products in U.S. and Canada will show you the many pluses in protection awaiting you all through the B&L lines—and vision screening for safer, more productive use of eyes on the job by means of the famous B&L Industrial Ortho-Rater.

Why shouldn't superior eye protection be an achievement of Bausch & Lomb! World leaders in ophthalmic research, with the only glass plant in the Western Hemisphere devoted exclusively to manufacture of optical glass, Bausch & Lomb leads in all forms of eyesight conservation.

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Exotic metals, high temperature and other special alloys for space age applications are regularly rolled to exacting specifications by Rodney. Rodney's laboratory is fully equipped with the latest instruments for mechanical and chemical testing, and Rodney's experienced research and development personnel are always available for consultation on your special problems.

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Winner

R. P. Schafer is not playing with his son's Erector set there. He's showing a model of boring equipment made by Penndrill Mfg. Div., Pittsburgh, Pennsylvania Drilling Co.

The model idea was suggested by a STEEL story (July 4, 1960, p. 40). Penndrill Manager Schafer got busy, had a model made, and it's now "an essential sales tool for our organization." What's more, he won $1000 for submitting the idea in our 1960 Usership contest.

On the Front Burner

The handsome four-color photo you see on the cover this week comes from Rocketdyne Div., North American Aviation Inc., Canoga Park, Calif. Technical Editor Bob Huber was out there a while ago and happened upon it when Rocketdyne's Frank E. Zeigler and R. S. Greenwald were showing him pictures of what they make.

They flipped by this one which showed a molybdenum alloy, thrust chamber skirt. Bob said, "Whoa!" because he knew moly was one of the metals covered in our refractory metal study (Page 115). He sent it to Associate Managing Editor Vance Bell, in charge of the refractory project. He approved it, and a good cover was born.

On the Back Burner

Next week, we will present our guide for tool steels, carbides, and ceramic cutting tools. It lists more than 1200 tradenames of 79 companies—the most complete directory of tool material tradenames available. Its purpose: To help you compare and select those materials.

"Tops! Congratulations . . ."

So writes W. A. Horst, assistant to the plant manager of Trailmobile Inc., Cincinnati, about our impact report on Price Fighting in the Apr. 17 issue.

"Tremendously impressed with your 'Price Fighting' job," says H. A. Harrison, advertising and sales promotion manager of Young Spring & Wire Corp.'s Equipment Div., Bowling Green, Ohio.

"It is the first such treatise on pricing that we have seen, and it is excellent," says George B. Haas, advertising manager for Earle M. Jorgensen Co., Los Angeles.

In all conscience, we must report that at least one reader had a reservation about the impact study. Says Orrin B. Werntz, executive vice president of National Screw Machine Products Association, Cleveland: "You had a wonderful story on Apr. 17. I bought 100 copies—at an outrageous price. You evidently practice what you preach—no price cutting."

Additional copies of the study on Price Fighting are available at $2 a single copy; prices for larger quantities can be obtained on request. Write Reprint Dept., STEEL, Penton Bldg., Cleveland 13, Ohio.

Eternal Vigilance

Copy editors have to be on their toes. And ours, Harry Chandler, is. People like Mrs. Helen C. Hannon at Forney's Inc., New Castle, Pa., have a sharp eye for matters like double ms in programming.

"I've always spelled it with two, but I note in your article on a tape controlled drilling unit (Mar. 27, p. 191), you spell it with one. What's the answer?"

The answer, Harry reports, is that Webster can't make up his mind and spells it both ways. In such cases, we use the first spelling listed. (It's programing in this instance.)

Incidental Intelligence

Item: Twin Disc Clutch Co., Racine, Wis., won the U. S. Chamber of Commerce top award in its class for effective communication with employees and its community. In STEEL's Jan. 5 impact report on people power, we reported on that program (p. 132).

Item: Russian Air Force Major Yuri Gagarin was once a metalworker. The first man in space is a former foundry molder and foundry engineer.

Item: A normal airplane landing is four times smoother than a ride on city streets, tests recorded on an FCA computer show.

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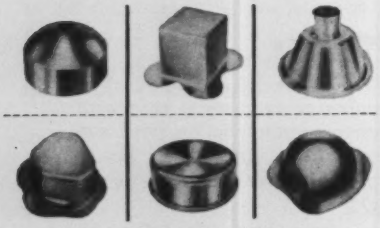

Closest tolerances adhered to in all metals, including MU METAL, BRASS, INCONEL, ALUMINUM, COPPER, CARBON STEEL, STAINLESS STEEL, NICKEL, MAGNESIUM, TITANIUM, SILVER, SPECIAL ALLOYS, HAYNES STELLITE.

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METAL CRAFTSMEN SINCE 1924

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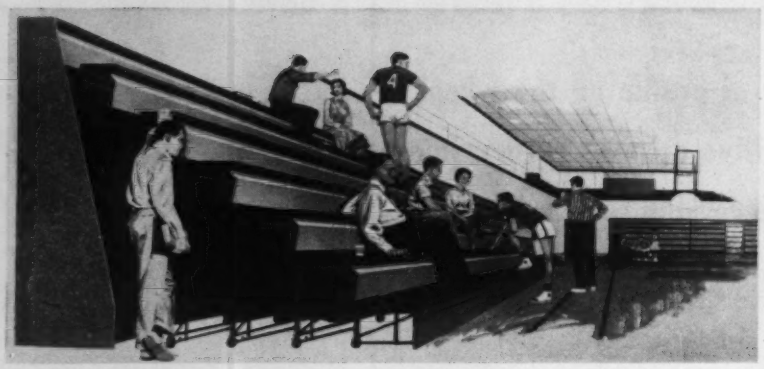
How to use Clad-Rex vinyl-clad metal in the design and engineering of school equipment and other products



Vinyl-on-Steel Folding Gymnasium Seating by Brunswick

The sheet metal nature of Clad-Rex vinyl-clad metal would seem to indicate generally how it can be used. However, the unusual characteristics added by the vinyl coating itself make the areas of usage much broader than might be expected. So as not to overlook possible applications within your product line, consider Clad-Rex as a basic material. Measure each of its advantages against the individual parts and subassemblies of your products as well as the whole enclosure. In this manner your manufacturing methods and costs, sales appeal, and product profit can be best helped.

The sales appeal of Clad-Rex vinyl-clad metal

The vinyl surface of Clad-Rex is in fact, a finish. It is available in a broad range of colors and embossed textures. Actually Clad-Rex provides an almost unlimited variety of stock and custom multi-color patterns. Special prints in register can be provided also.

The abrasion resistance of Clad-Rex vinyl-clad metal

The vinyl surface of Clad-Rex, being a poly-vinyl chloride film, offers great resistance to abrasion. Texturing effectively hides even metal-deep cuts in the vinyl surface.

The newly designed folding gymnasium seating (shown above) takes full advantage of the abrasion resistant nature of Clad-Rex vinyl-clad metals. In this application Brunswick is using a practical, yet inviting leather grain pattern. This eliminates

the coldness of painted metal, as well as the relatively delicate finish of wood.

The corrosion resistance of Clad-Rex vinyl-clad metal

Having all the advantages of poly-vinyl chloride, the surface of Clad-Rex vinyl-clad metal protects against acids, alkalis and other corrosive chemicals. It is free of pin holes. As a result, it offers unusual dielectric properties as well. Outdoor weatherable or stain-resistant vinyl-clad metals are also available.

The fabrication of Clad-Rex vinyl-clad metal

Brunswick's methods for fabricating Clad-Rex vinyl-clad metal are much like they used for bare sheet metal.

Finishing, of course, is not needed. Press and brake forming, crimping, punching, expanding, etc., are all practical.

Most important to any remarks about fabrication—although Clad-Rex is obviously different from bare metal, the unusual quality of the vinyl-to-metal bond tends to minimize the difference. As a result, Brunswick fabricates within their own facilities without complex or unusual techniques or tooling.

Although Clad-Rex vinyl-clad metal parts can be assembled with stud and projection resistance welding, some limitations in spot and seam welding do exist. Until the present research for a solution is completed, other conventional methods of joining should be used.

A source of engineering service

Take full advantage of the engineering and research facilities of Clad-Rex. Call or write for Report 6101, "How to Use Vinyl-Clad Metal in the Design and Engineering of Commercial Furniture". *Simoniz Industrial Products, 11504 West King Street, Franklin Park, Illinois (Phone Gladstone 1-2323).*

24C

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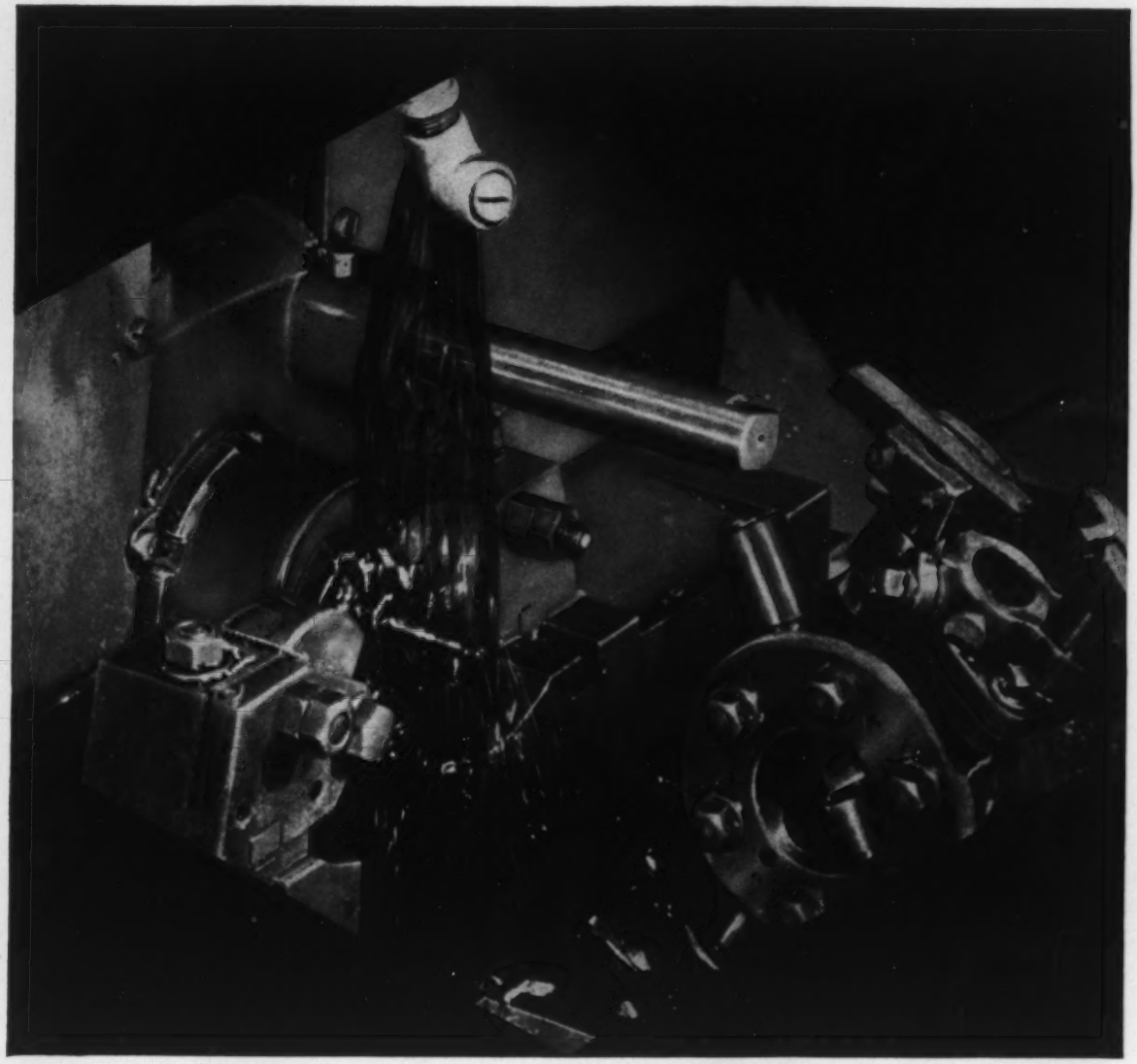

Replace those black, sulfurized oils! Get cooling, cutting properties you need in a transparent Sunicut cutting oil that lets operators *see* tools, workpieces, finishes and micrometer readings. Sunoco has a wide range of high quality, non-emulsifying Sunicut cutting oils for general-purpose or special-problem operations. They pump easily, wet metal fast, have high film strength, will not stain operators' hands or clothing.

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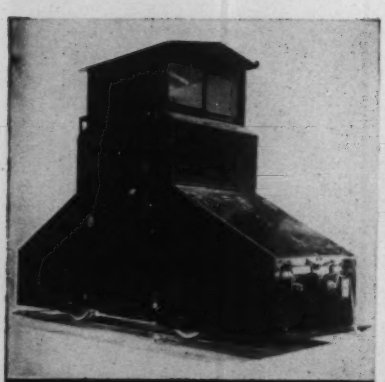

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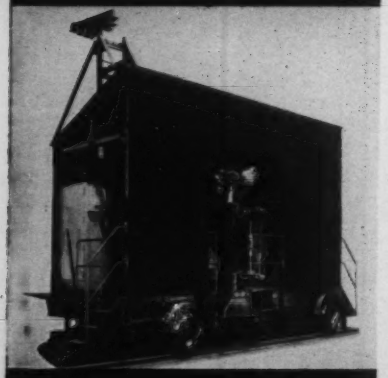
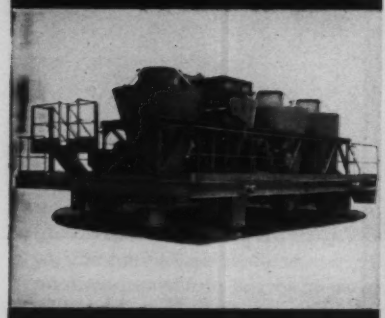


DOOR MACHINE



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CALENDAR OF MEETINGS

May 18-19, National Industrial Conference Board Inc.: Annual meeting, economic conference, Waldorf-Astoria Hotel, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

May 21-24, Industrial Heating Equipment Association Inc.: Spring meeting, The Homestead, Hot Springs, Va. Association's address: 1145 19th St. N.W., Washington 6, D. C. Executive vice president: Robert E. Fleming.

May 22-25, American Society of Mechanical Engineers: Design engineering conference and show, Cobo Hall, Detroit. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: O. B. Schier.

May 22-26, American Society of Tool and Manufacturing Engineers: Annual convention and exhibit, Statler-Hilton Hotel, New York. Society's address: 10700 Puritan Ave., Detroit 38, Mich. Executive secretary: Harry E. Conrad.

May 23, Southern Industrial Distributors Association: Annual meeting, Dennis Hotel, Atlantic City, N. J. Association's address: 1626 Fulton National Bank Bldg., Atlanta 3, Ga. Secretary-treasurer: E. L. Pugh.

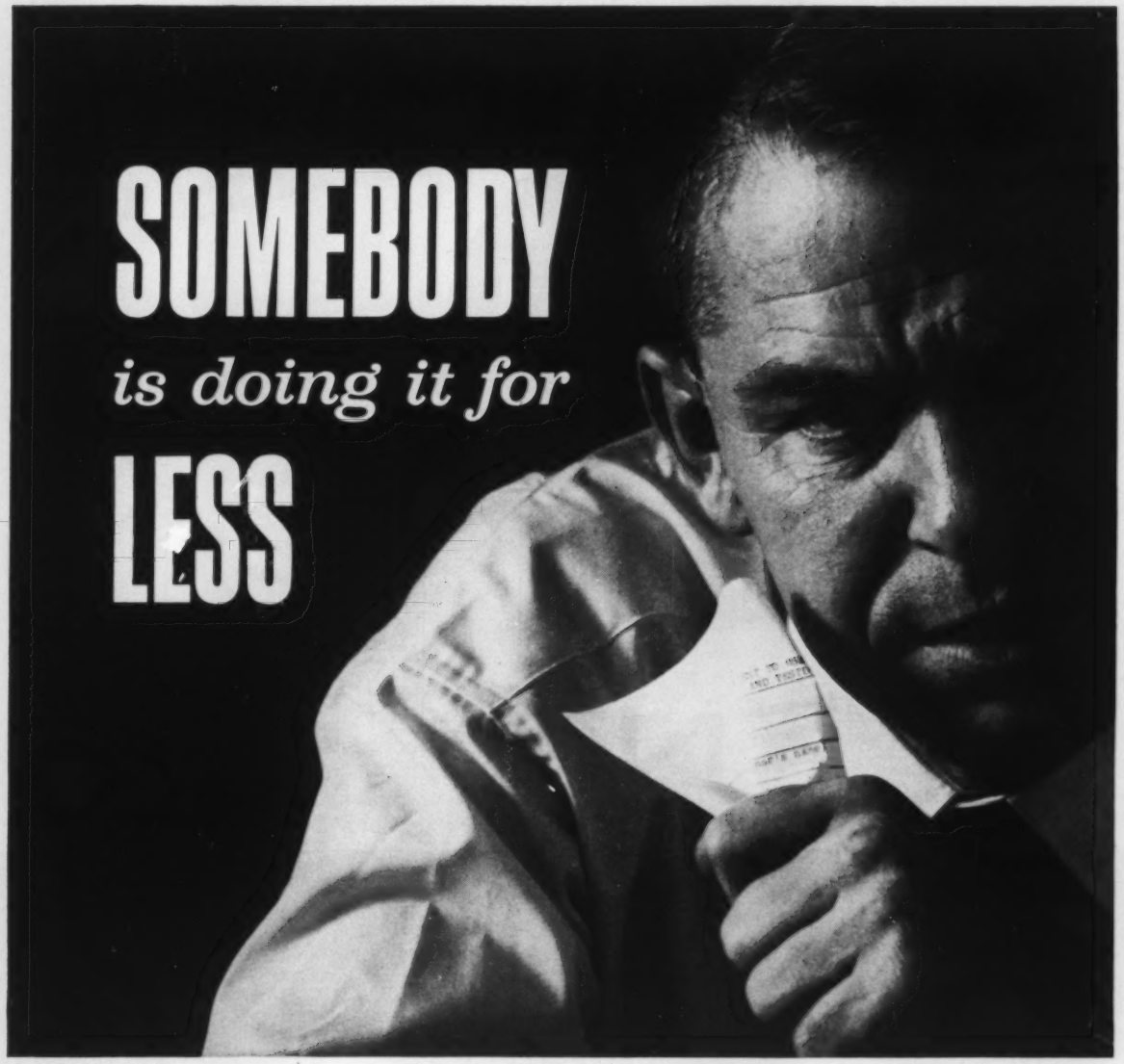
May 23-25, American Supply & Machinery Manufacturers' Association: Annual meeting, Traymore - Shelburne - Dennis Hotels, Atlantic City, N. J., and Triple Industrial Supply Convention, Convention Hall, Atlantic City. Association's address: 2130 Keith Bldg., Cleveland 15, Ohio. Business manager: W. B. Thomas.

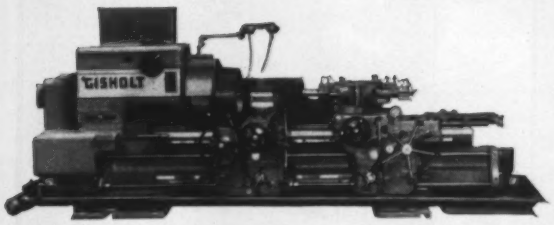
May 24-25, American Iron & Steel Institute: Annual meeting, Waldorf-Astoria Hotel, New York. Institute's address: 150 E. 42nd St., New York 17, N. Y. Secretary: George S. Rose.

May 24-26, Electronic Industries Association: Annual convention, Pick-Congress Hotel, Chicago. Association's address: 1721 DeSales St. N.W., Washington 6, D. C. Secretary: James D. Secrest.

May 29-30, Wire Reinforcement Institute Inc.: Annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va. Institute's address: National Press Bldg., Washington 4, D. C. Managing director: Frank B. Brown.

May 29-June 3, Concrete Reinforcing Steel Institute: Annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va. Institute's address: 38 S. Dearborn St., Chicago 3, Ill. Managing director: H. C. Delzell.


SOMEBODY
is doing it for
LESS



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Offers maximum operator ease: speed selector for 12 or 24 spindle speeds; separate lever controls for cross and longitudinal rapid traverse. With cross-feeding hex turret, standard tools handle all types of machining. JETracer® (for cross slide, cross-feeding hex turret, or mounted on turret face) handles tapers, contours, steps and combination forms automatically.

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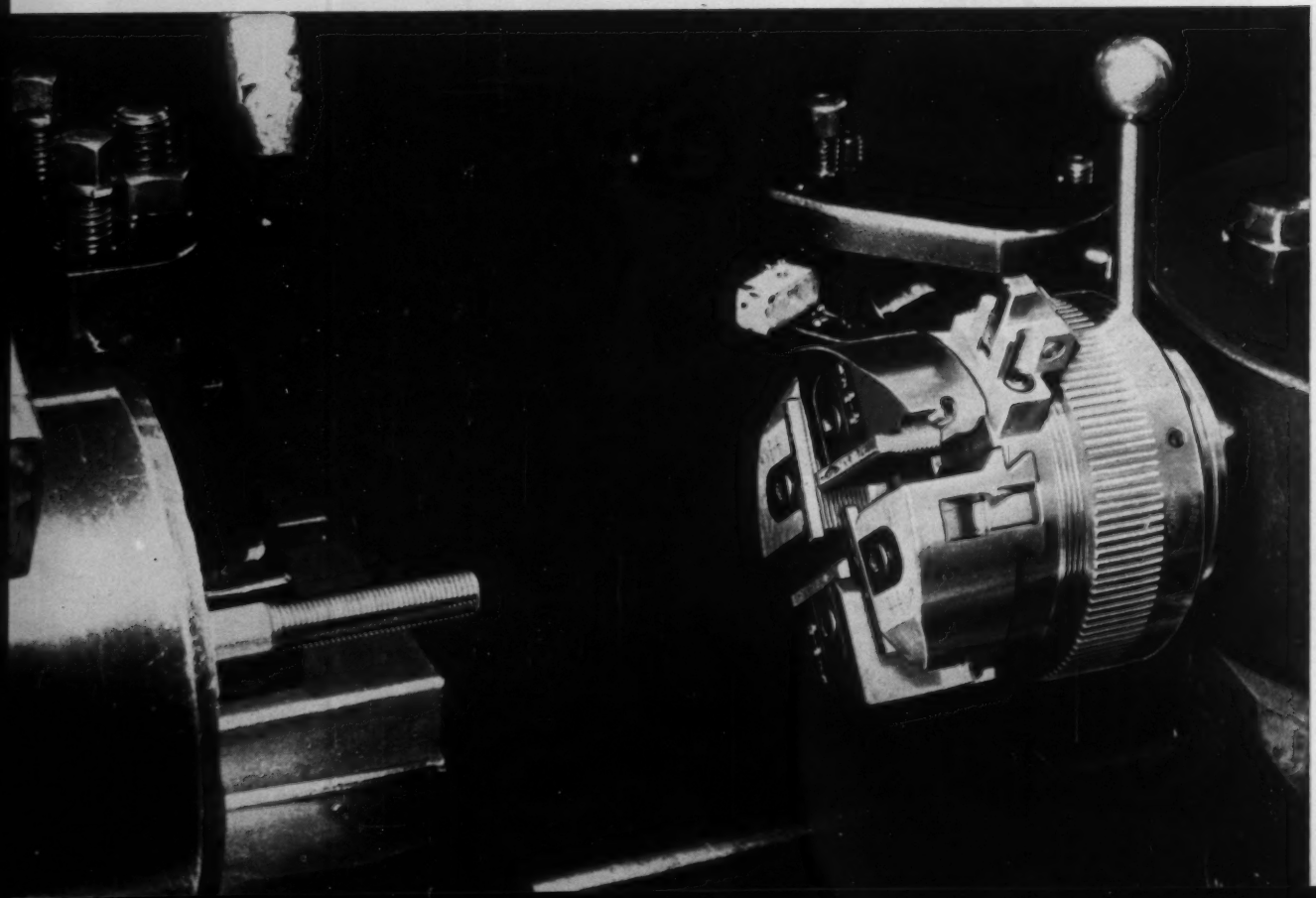


HELD TO .002"

between workpiece O.D. and thread with **LANDIS** *Die Head*

Centering Throat Chasers enabled the LANDMATIC Head to solve a difficult threading problem at the Minneapolis-Honeywell Regulator Co., Valve Division, in Philadelphia, Pa.

Threads on valve stems for diaphram control valves were required to meet a concentricity tolerance of .002" total indicator reading. The 5HH LANDMATIC Hardened and Ground Head using Centering Throat Chasers is the only head tested capable of producing these results.

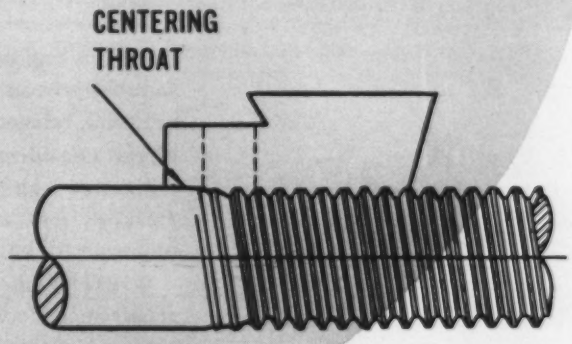
The Centering Throat Chasers used in this operation are specifically designed for producing threads requiring a high degree of concentricity with the outside diameter of the workpiece. Thus they are particularly adapted for cutting long thread lengths where there is a tendency of the workpiece to run out-of-round.

As indicated on the drawing, the centering throat section is allowed to protrude from the chaser cutting edge. This projection varies from $\frac{1}{8}$" for the coarse pitch threads to $\frac{1}{16}$" for the finer pitches. No cutting action takes place on this section of the chaser as it extends over the rotational centerline of the workpiece and only acts as a work aligning and supporting surface.

To produce these stems, $\frac{3}{8}$" 24-pitch UNF threads are cut $1\frac{5}{8}$" long on 316 stainless steel. Cutting at 30 SFM the 5HH LANDMATIC Head mounted on #2 B & S Hand-Operated Screw Machine, produces these threads to *Class 3 tolerances.* Entire lots of 400 pieces are run without regrinding the chasers.

The LANDMATIC Hardened and Ground Head is a stationary head, designed and built to give the great rigidity required for precision threading. It is available in a variety of sizes for producing threads from $\frac{1}{16}$" to 2" in diameter, and uses the LANDIS Tangential Chaser which may be reground and used for 80% of its original length.

For detailed information, write for Bulletin F-80 — please include specifications.



LANDIS *Machine* **COMPANY** | WAYNESBORO PENNSYLVANIA

473C

STORKLINE CRADLES YOUNG AMERICA WITH REPUBLIC WIRE

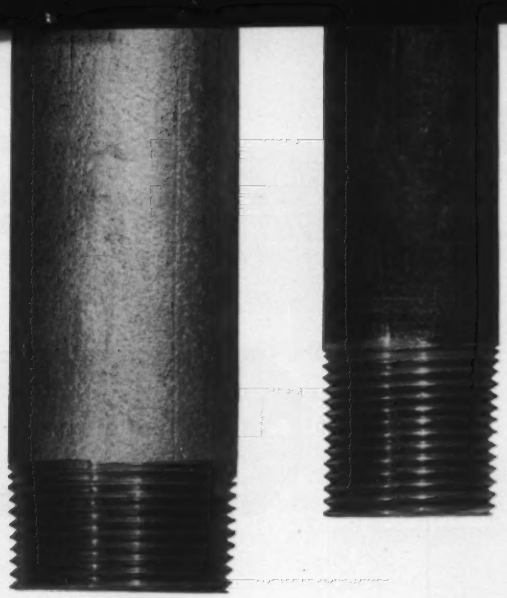
Durability and comfort are extra important in baby cribs and youth beds. Durability because Junior loves to bounce and play. Comfort to insure healthful, relaxed sleep. Storkline Furniture Corporation, Chicago, gives careful consideration to these factors.

Fourteen gage Republic Link Wire, produced to the exacting Storkline standard of quality, is formed into the link fabric which is so important in building Storkline furniture.

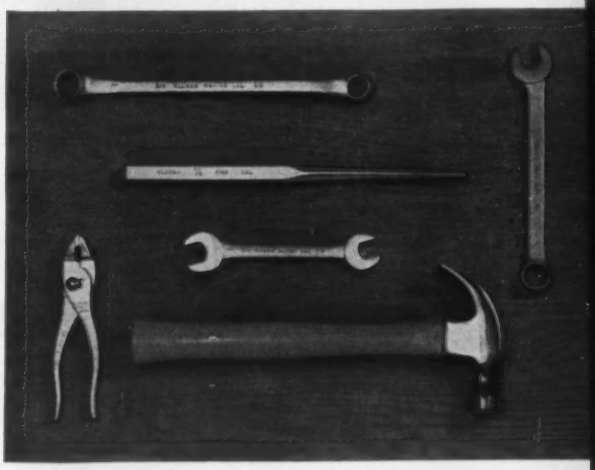
WHATEVER YOUR PRODUCT, your quality, cost, and production requirements are carefully studied by Republic Metallurgists before they recommend a wire specification. These men know how important wire physicals, finish, cast, and size accuracy are to your finished product quality. They're at your service, at no obligation, where and when you need them.

For specific data on Republic Wire Products (including a full range of manufacturer's coarse, spring, screw, rivet, and heading wires), and information on Republic Wire Metallurgical Service, send the coupon.

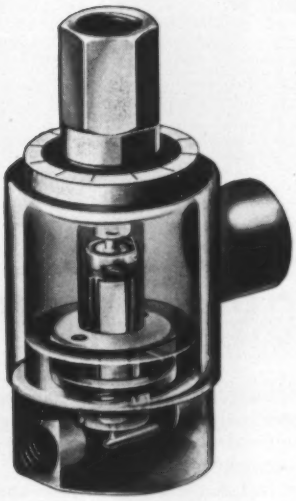
This STEELMARK of the American Steel Industry tells your customers a product has the comfort and long life of Steel Spring Wire. Use it on the products you sell.



LONG-LIFE, low-cost Republic Steel Pipe, choice of operations and maintenance men to handle dozens of tough industrial jobs. Constant quality control at Republic results in pipe of outstanding uniformity in quality, size, and weld-strength. Tight, galvanized coating stubbornly resists corrosion and fabrication damage. Your local Republic Dealer can supply clean, rust-free Republic Pipe in the sizes you need. Write for data.



REJECT RATE AT AN ALL-TIME LOW, customer satisfaction high, reports Vlchek Tool Company, Cleveland. A high volume manufacturer of quality mechanics' tools, Vlchek forges hammers, wrenches, punches, pliers, and other tools from three top grades of Republic Hot Rolled Carbon Steel. As the nation's largest supplier of forging quality steels, Republic offers a complete range of sizes, shapes and types. Send the coupon for information.



MACHINABILITY AND CERTAIN MAGNETIC PROPERTIES are key reasons for Skinner Electric Valve Division, Skinner Precision Industries, Inc., selecting Republic Cold Finished Stainless Steels. Republic Type 303 non-magnetic stainless is used in part of the sleeve assembly, metering pins, and body orifices of solenoid valves. Type 430-F provides the excellent machinability, magnetic properties, and wear resistance for precision internal valve parts and valve bodies. Return the coupon for data on the more than 40 standard types of Republic Stainless Steel.

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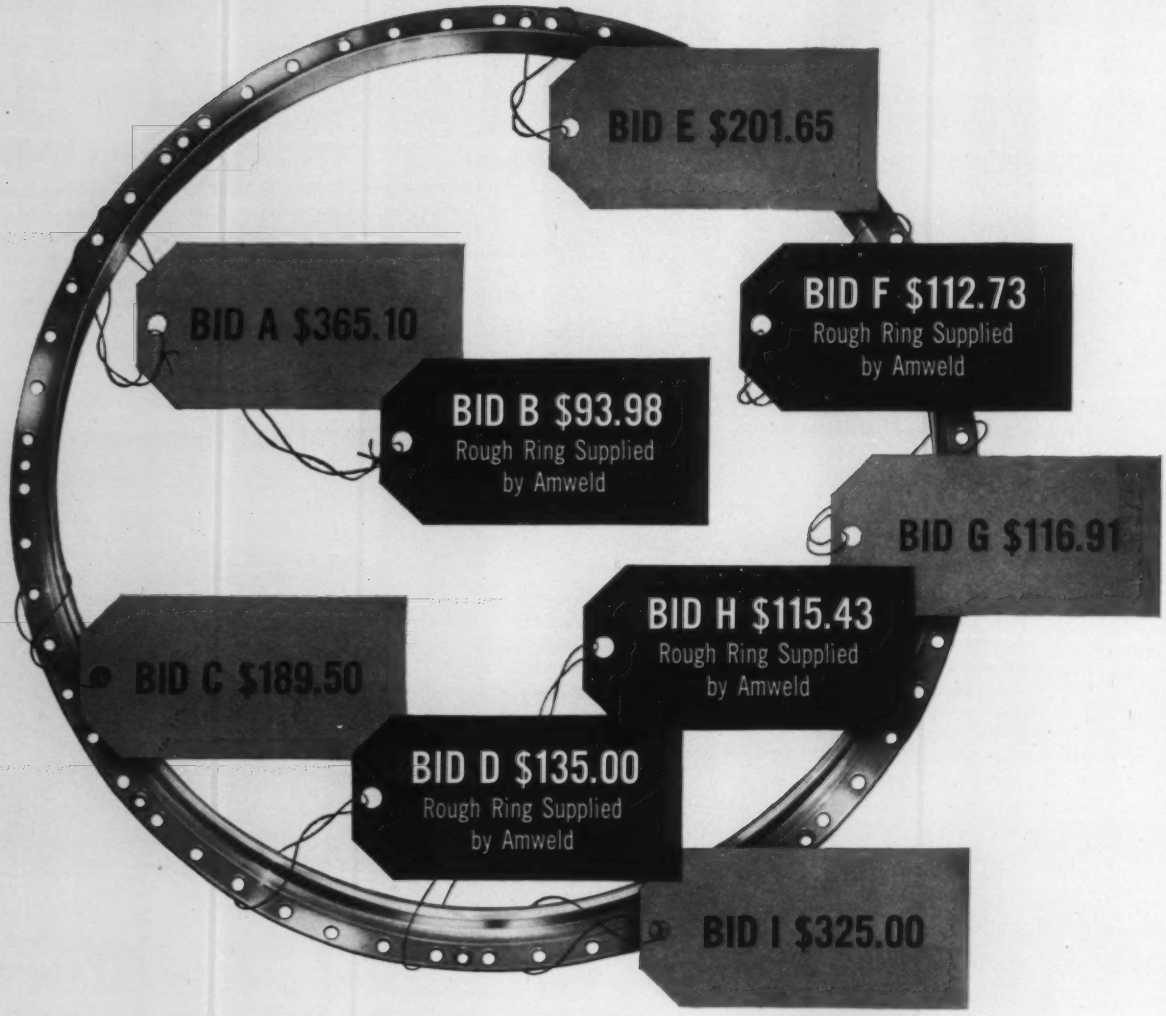

FOUR OUT OF FIVE LOW BIDDERS BASE QUOTES ON ROUGH RINGS BY AMWELD

Early this year nine companies submitted manufacturing bids ranging from $93.98 to $365.10 on this circular jet engine turbine shroud. **Four out of the five lowest bidders submitted their finished shroud quotation based on rough rings, flash butt-welded, furnished by Amweld.**

Whether you're bidding for military or commercial business, Amweld flash butt-welded rings can save you money—can help you get more business. The quality of Amweld rings has been proved repeatedly in jet engines and missiles. The cost reduction opportunity presented by Amweld rings enabled Amweld customers to save over $1,000,000 on circular components and assemblies last year alone.

Investigate now! Let Amweld review your circular component requirements and figure actual cost savings to you with Amweld flash butt-welded rings. Send your drawings and specifications today: The American Welding & Manufacturing Co., 803 Dietz Road, Warren, Ohio.

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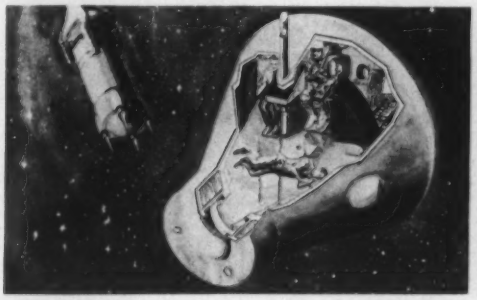
Are We Overlooking Our Financial Might?

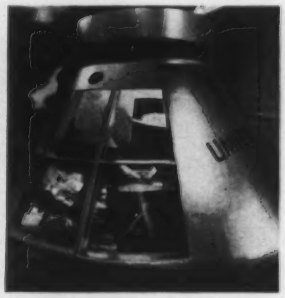
"It is beyond question that we have the financial machinery and methods to finance an accelerated rate of growth without inflation . . . it is beyond question that knowhow is available. But it may not be in the hands of those making the decision. Or it may not be fully appreciated by them. Or what is far more likely, it may not be used because of inertia, company precedent, or just plain lack of business courage." So asserts Raymond Rodgers, New York University professor of banking in a publication of the National Association of Credit Management. He says a more rapid rate of economic growth is imperative for the U. S. and that the money to grow on is available. But management must use it properly.

GNP, Productivity, Real Income to Jump, Says Professor

Even without "novel programs," gross national product should reach $750 billion by 1969, says Prof. J. Philip Wernette, University of Michigan economist. That's 50 per cent above the present level. Professor Wernette foresees a productivity increase of 25 per cent and a rise in real income per person of 30 per cent. His outlook is based on a 25 per cent hike in the work force and a 15 per cent boost in population.

Republic Says This'll Circle the Moon





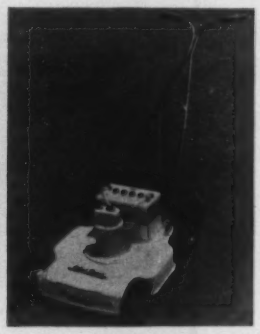
After the Mercury moonshot, astronauts may orbit the moon in a spacecraft like this one, says Republic Aviation Corp. It's designed to carry a three man crew on a 14 day reconnaissance orbit of the moon. It could also be used as an earth-orbiting laboratory. The ship is in the Project Apollo class, deemed to be the next step after Project Mercury. The part of the full-scale model shown is the re-entry section of the spacecraft, which is designed for a 14 day lunar orbit. The dummies are in the re-entry position.

Blough Notes Order Upturn; Blasts Tax Proposal

Roger Blough, chairman, U. S. Steel Corp., notes "a gradual but noticeable improvement" in orders. U. S. Steel's April shipments were the best so far this year at about 1.3 million tons. (For first quarter earnings of U. S. Steel and other firms, see Page 77.) At the annual meeting, Mr. Blough struck

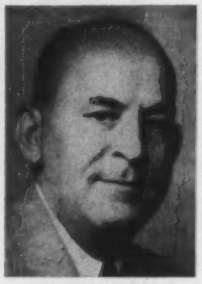
out at the Kennedy administration's proposal to tax the first $50 of dividend income. Mr. Blough contended that the exclusion is not a "loophole." He said the double taxation of dividend income "has been and is a deterrent to economic growth and employment." He pointed out that the functioning of the U. S. economy is dependent upon the "slender thread of dividend income." He urged stockholders to voice their opinions of the proposal to their congressmen.

New Frontiers Being Found for Lead



This battery powered car (that operates for 1 cent a mile, is recharged from a household electric outlet) and this silent lawn mower (which cuts 15,000 sq ft of lawn at a power cost of 2½ cents) are two examples of the lead industry's success in garnering new markets. Members of the Lead Industries Association, at their annual meeting last week, heard of other applications, including: 1. Use of piezoelectric lead zirconate-titanate in sonar, ultrasonic cleaning, and gas engine ignition. 2. Use of thermoelectric lead telluride in power generating devices. 3. Use of pearlescent lead pigments in decorative coatings.

What You Can Do about Depreciation Reform

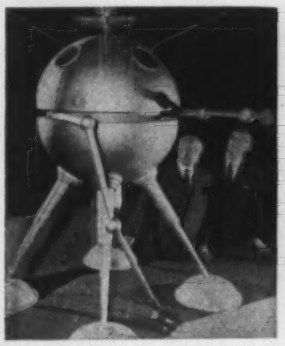


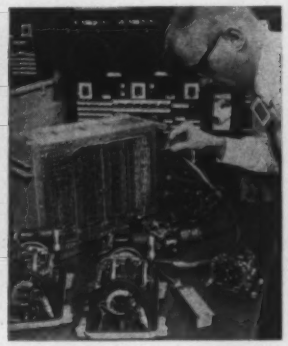
"This nation has failed miserably to provide an economic climate in which industrial growth is possible," charges G. M. Stickell, president, Landis Machine Co., Waynesboro, Pa. "One example: Unrealistic depreciation policies forced on U. S. industry by our federal government. This has resulted in compelling our industry, with obsolete equipment, to compete with nations having modern plants." For suggestions on solving this problem, see Page 81.

March Sales Reports Are Better

The Industrial Fasteners Institute's index of shipments rose to 76 in March from 74 in February (1956-58 = 100) . . . Home laundry appliance factory sales in March rose 27 per cent above the February level to within 4 per cent of the March, 1960, pace, reports the American Home Laundry Manufacturers' Association . . . March sales of vacuum cleaners rose 3 per cent above the mark for the year-earlier month . . . The Gas Appliance Manufacturers Association reports that March sales of gas ranges rose 18 per cent above the February total, while sales of water heaters rose 21 per cent, and sales of gas incinerators fell 5 per cent.

Two Ideas for Spacemen





Here are two more ideas in the flood of proposals being made by companies with a stake in the space race. In photo at left, Radio Corp. of America's chairman, David Sarnoff (left), and President John Burns examine a model of a "moon crawler." It's equipped with TV, a claw for picking up samples of moon surface materials, and antennas for communication with earth bases. It could be operational "well within five years," says Mr. Burns. The photo at right shows the five gyroscopes (foreground) and the electronic brain that Minneapolis-Honeywell Regulator Co. has supplied for the Project Mercury capsule.

Kaiser and Alcoa Hit by Antitrust Suits

In two days, the Justice Department filed three major antitrust suits against companies in the aluminum industry. One seeks to force Kaiser Aluminum & Chemical Corp. to give up the wire and cable facility acquired from U. S. Rubber Co. four years ago. The complaint charges that the acquisition substantially lessened competition in the electrical conductor field and the aluminum wire and cable field. Another suit seeks to block Kaiser's planned consolidation with Kawneer Co. The third would force Aluminum Co. of America to divest itself of Cupples Products Corp. of St. Louis.

We're Exchanging Philosophies with Russia, Says Kirkpatrick

It can be argued that the U. S. and Russia have been exchanging national philosophies, asserts Forrest H. Kirkpatrick of Wheeling Steel Corp. "In our insistence that all men engaged in the same jobs should be compensated alike, regardless of activity or quantity and quality of production, we have been moving toward the fundamental principles of Marxism. The Russians, convinced that exceptional energy and ability are national assets, have adopted some of the stimulating practices associated with capitalism."

Interest in Water Desalting Picks Up

Fairbanks Whitney Corp. hopes to begin production of its first water desalting equipment for commercial sale this year, David Karr, president, said at the annual meeting last week. He said the firm is negotiating with numerous countries and U. S. coastal communities interested in supplying their fresh water needs from the sea. "It is our hope that the water desalting business will begin to accrue profits in 1962," he said. Other firms active in the field include American Machine & Foundry Co., Fluor Ltd., Ionics Inc., Struthers Wells Corp., Pfaudler Permutit, Blaw-Knox Co., Cooper-Bessemer Corp., Florida Power Corp., Carrier Corp., Scientific Design Co. Inc., General Elec-

STEEL The Metalworking Weekly

May 8, 1961 Vol. 148 No. 19

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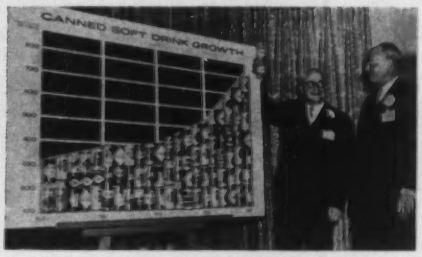
29 W. 39th St., New York 18, N. Y.

tric Co., Westinghouse Electric Corp., Chicago Bridge & Iron Co. On May 19, ground will be broken for a saline water conversion demonstration plant in Webster, S. Dak. The Interior Department is sponsoring the project. Construction will be handled by Austin Co. of Cleveland and Asahi Chemical Industry Co. of Japan.

Cans Get Bigger Share of Soft Drink Market

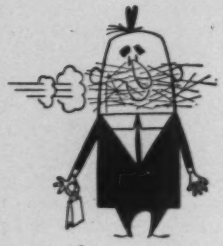
R. J. Sund, president of American Can Co., shows W. C. Stolk, chairman, how sales of canned soft drinks have grown from 314 million units to 800 million in the last five years. Industry volume, now $30 million annually, rose 50 per cent last year.



The Security Seekers

The United Auto Workers' constitutional convention has approved a flexible bargaining program aimed at more job security and more jobs. Proposals include a short workweek, early retirement, more holidays, longer vacations, and sabbatical leaves. Company men still think the UAW really wants bigger SUBenefits, company paid medical and surgical insurance, increased pensions, and a wage hike—all wrapped up in a two year contract. As a springboard into serious bargaining, the UAW is likely to propose that it have a voice in selecting suppliers, locating plants, and transferring jobs.

Straws in the Wind



Unemployment dropped by 533,000 to 4,962,000 in the month to mid-April, reports the Labor Department. Jobholders increased by 218,000 to 65.7 million . . . The National Aeronautics & Space Administration has started listing proposed unclassified R&D contracts leading to prime contracts of $100,000 or more in a daily Commerce Department publication . . . The Labor Department has set up an Office of Automation and Manpower to develop programs for testing, counseling, training, and placing workers displaced by mechanization or upgrading workers who don't have the skills needed for today's level of technology. Conferences with employers affected by technological change will be part of the office's program.

Metalworking Pulse

The Business Trend: Advancing for the sixth consecutive week, STEEL's industrial production index hit a new 1961 high during the week ended Apr. 29. At a preliminary 157, it was 10 points above the month-ago level. **Autos:** New car stocks are just about where automakers want them—a little over 900,000 units. So weekly production schedules will quickly reflect any sales fluctuations in the individual ten-day selling periods. **Steel:** Ingot output rose for the eighth straight week.

- **INDUSTRIAL PRODUCTION INDEX**
  (1947-49=100)
  Week ended Apr. 29 .... 157†
  Year Ago 164
  Details on Page 91

- **PASSENGER CAR OUTPUT (UNITS)**
  Week ended May 6 .. 118,000*
  Year ago 142,091
  Details on Page 88

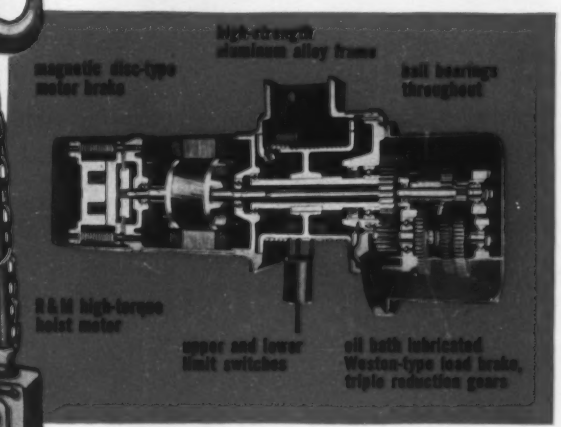
- **STEEL INGOT OUTPUT (TONS)**
  Week ended May 6 . 1,900,000*
  Week ago 1,858,000
  Details on Page 164

†Preliminary. *Estimated.

HOISTS/CRANES

RUGGED, RELIABLE, LOW PRICE HOIST

Low price . . . yes! But within the rigid, high-strength aluminum alloy frame and steel covers of R&M's Type J Hoist, you'll find carefully engineered features that assure rugged, reliable duty! The high-torque, totally-enclosed R&M motor has 30 min., 55° C. time-rise rating. Magnetic disc-type motor brake prevents hook drift . . . you get a Weston-type load brake too. Upper and lower limit switches prevent hook block over-travel. Triple-reduction gearing of heat-treated alloy steel gives hard working surfaces and shock-resistant teeth. Ball bearings, used throughout, are oil bath lubricated or lifetime sealed. Push button magnetic controls operate on reduced voltage. Type J's are stocked near you, in capacities of ¼, ½, 1 and 2 ton. Lug mounting is standard . . . choice of push, hand-geared or motorized trolley. Write today for Bulletin 905-ST .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Thread rolling a sucker rod. The coolant: Gulfcut Heavy Duty Soluble Oil. It helps Liberty produce an unusually fine thread.

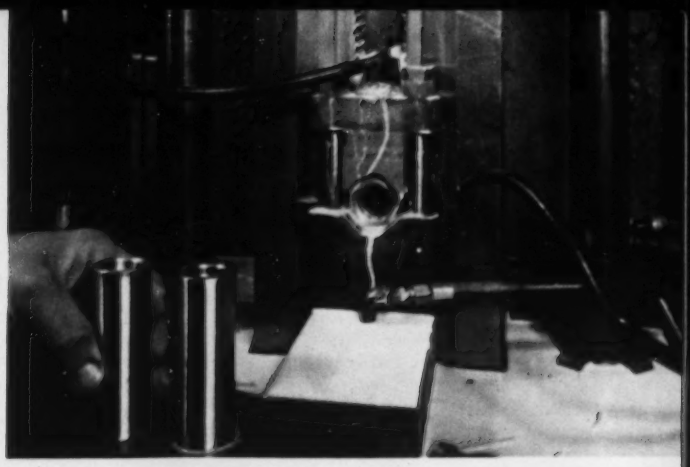
Change to Gulfcut® Heavy Duty Soluble saves thousands of dollars yearly...

Liberty Manufacturing Company has a certain distinction in the oil industry. This Fort Worth, Texas, firm was the first to market ½-inch sucker rods—used in oil wells to actuate the pumps which bring oil to the surface.

Some months ago, the company switched from a chemical coolant to Gulfcut® Heavy Duty Soluble Oil—and eliminated a costly degreasing operation. Previously, degreasing was necessary before sucker rods could receive a coat of protective paint.

"We use a ratio of 20 parts water to one part oil," says Mr. W. V. Barbee, Plant Superintendent. "The result: a light film of oil. It protects the rods against rust, yet isn't heavy enough to make us degrease before painting.

"We've benefited in other ways from the change-over. For instance, we haven't found one bit of rust in any machine-operated part. Paint peeling is no longer



Slotting a 5/8" couplet which fits on the end of a sucker rod. Gulfcut Heavy Duty Soluble Oil is the coolant.

W. V. Barbee, left, Plant Superintendent, and Frank Mauro, Gulf Sales Engineer. In background is stack of sucker rods.

Oil eliminates degreasing operation, GULF MAKES THINGS RUN BETTER!

a problem. And tool life seems to be much improved.

"Lastly, poorly rolled threads on sucker rod pins can lead to real trouble—broken joints out in the oilfields. But Gulfcut Heavy Duty Soluble Oil helps us get an almost perfect thread."

If you've got a tough machining problem, give us the opportunity to show you how Gulf makes things run better! Call a Gulf Sales Engineer at your nearest Gulf office. Or write for Gulfcut literature.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

GULF

SCIAKY ELECTRON BEAM WELDING

Here's how you can combine precision research and practical production electron beam welding in one equipment installation

Whether your interest in electron beam welding processes is for highly precise research or practical production work—or both—your data should be complete with details on Sciaky machines. They are most simple and practical in concept and operation.

GUN DESIGN GIVES EXCEPTIONAL ELECTRON OPTICS

The Sciaky Electron Gun produces specific beam density previously possible only with accelerating potential higher than 100,000 volts. The Sciaky gun, entirely contained within the atmosphere of the welding chamber, will operate in any angular position. *Both* gun and fixture can be moved to any position within the chamber while welding.

Figure 1

Advanced focusing design results in electron beam welds of 12 to 1 depth to width characteristics. Figure 1 shows a deep penetrating butt weld in type 304 stainless steel. Plate thickness is .5". Note lack of heat-affected zone.

GUN AN INDUSTRIAL TOOL

The gun construction is simple and rugged. Precise alignment is inherent in design, and is not dependent upon assembly adjustments. If necessary, filaments can be easily and quickly replaced in less than five minutes. As shown in Figure 2, the Sciaky Electron Beam Gun is small and

Figure 2

compact. A simple spacer arrangement optimizes gun optical system throughout a wide range of output power without compromise of specific beam energy. As a result, the

Figure 3

Sciaky gun is optimized at current ranges of 250, 150, 100 and 50 MA. at 30,000 volts. Output power is continuously adjustable within each range.

EFFICIENT PUMPING SYSTEM

Evacuation of chamber to welding pressure is obtained within 3 to 10 minutes, depending on chamber size. Pumping sequence is fully automatic, and without any manual adjustment. Automatic safety devices insure trouble-free operation and full protection of system.

RADIOLOGICAL HAZARDS ELIMINATED

Low voltage (30,000 v. maximum) and highly refined chamber design eliminate x-ray hazards to operator, which are a severe problem with higher voltage equipment. As a result, the Sciaky low voltage system needs no costly shielding, even when welding at highest output.

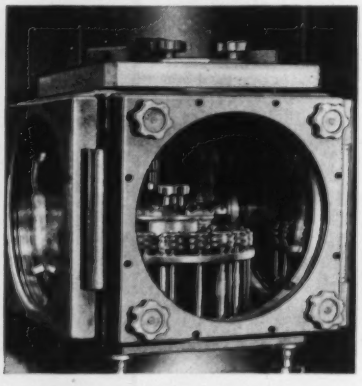


Figure 4

As shown in Figures 3 and 4, complete accessibility and visibility are provided by this latest Sciaky design. All sequence controls of the dial feed unit (Figure 4) are fully automatic. This production unit is being used to weld end-caps to tubes.

Regardless of your specific area of interest, you'll find the Sciaky combination of welding experience and electron beam technology is well advanced. Sciaky is Exclusive Licensee under Stohr, U.S. Patent 2,932,720.

81C8102

Please write for information — without obligation, of course!

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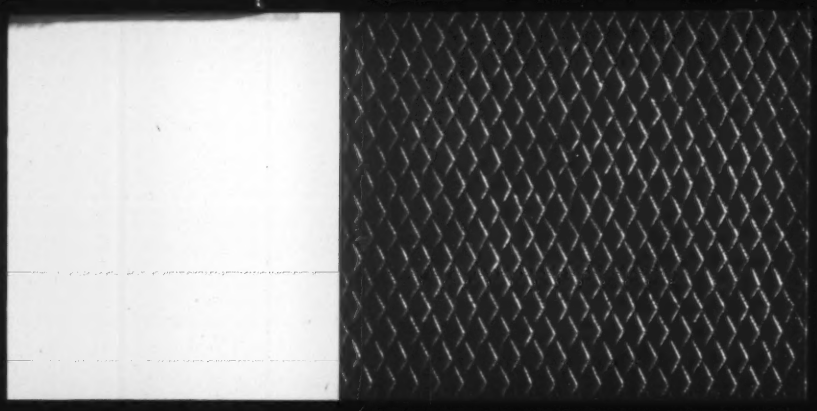

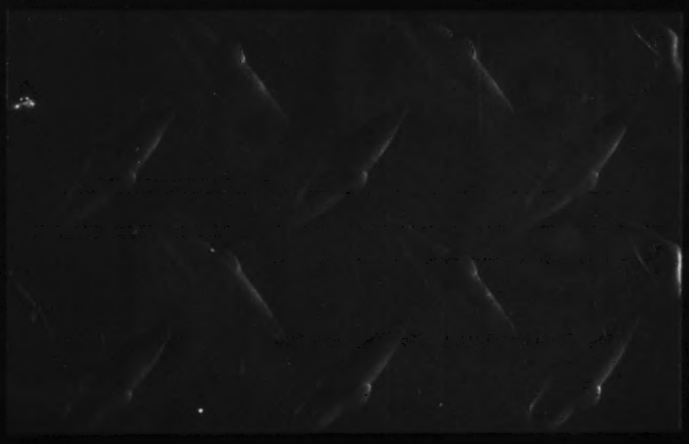

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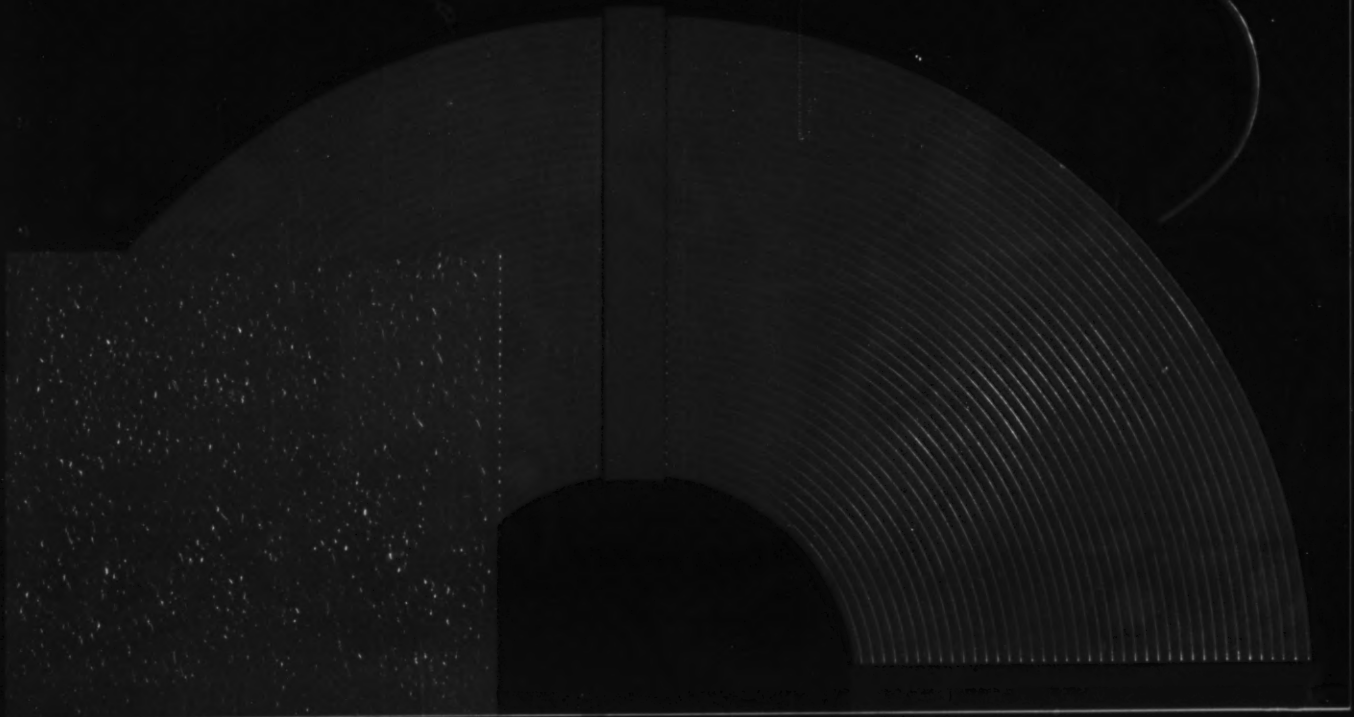

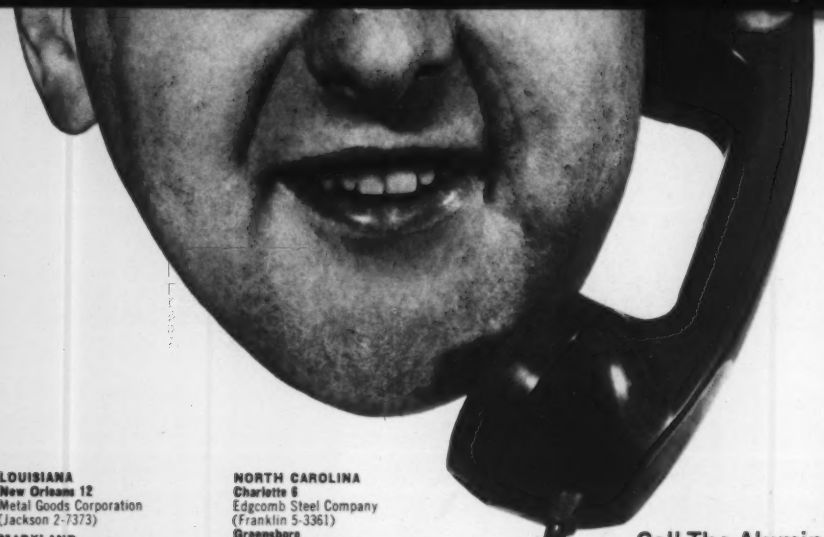

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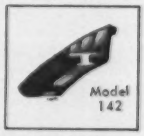
ENGINEERED OIL SEALS for Steel Mills

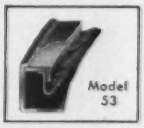
Garlock KLOZURE* Oil Seals (left) help keep lubrication in, dirt out of roll neck bearing at Inland Steel's East Chicago mill.

Inland Steel applies Garlock KLOZURE Oil Seals for protection of mill roll neck bearings at East Chicago.

Minimizing lubrication leakage from the inboard and outboard ends of the bearings, Garlock KLOZURE Oil Seals provide more constant service as the rolls change position in a lateral movement during operation. Inland finds, too, that in atmospheres of dirt, scale and spray, KLOZURE Oil Seals help keep foreign particles from entering—and damaging—the bearings.

For good, economical bearing protection, Inland joins the growing list of steel producers who use Garlock KLOZURE Oil Seals. Wherever you look in mills, you'll find a specific type of KLOZURE Oil Seals doing a specific job. Model 142, for instance, helps keep water splash and scale out of bearings at the shoulder of mill rolls. Models 64 and 82 protect bearings on back-up and work rolls. Model 53 is recommended for table rolls at normal and high speeds. Model 23 Split KLOZURE is ideal where equipment cannot be dismantled too easily.





Designed for peak efficiency and durability, Garlock KLOZURE Oil Seals resist oil and grease, are impervious to water, mild acids, alkalies, withstand temperatures from −40°F to +250°F. For extreme conditions, Garlock furnishes sealing elements resistant to practically any fluid, and serviceable as high as +500°F.

If you have a particular sealing problem, why not discuss it with your Garlock representative. He's backed by over 70 years of experience in engineering, production and application. Call him at the nearest of the 26 Garlock sales

GARLOCK

offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-181, Garlock Inc., Palmyra, New York.

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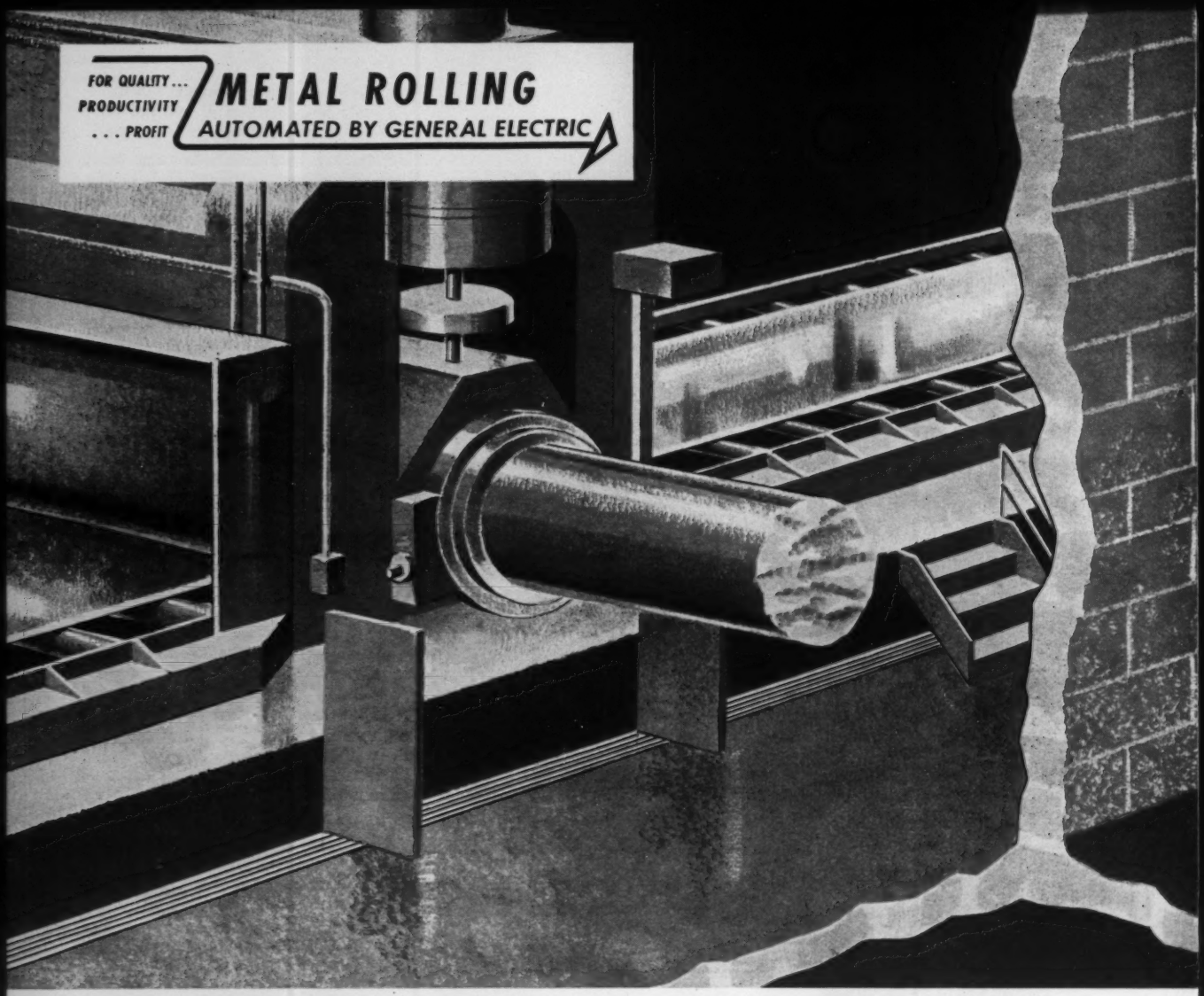


GENERAL ELECTRIC CONTROL FOR STEEL MILLS

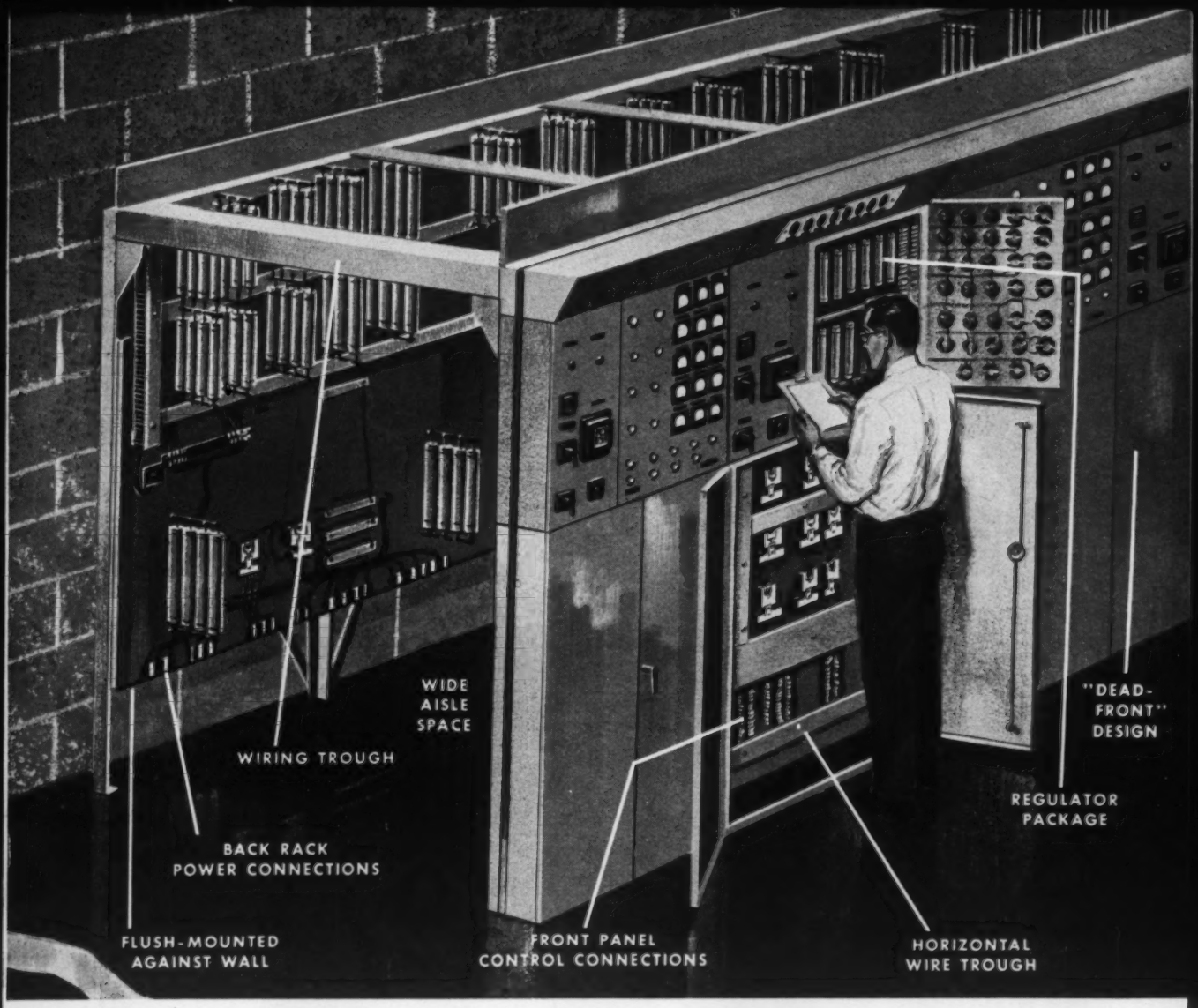
New control panels cut connection

General Electric has redesigned its industry-proved, heavy-duty, steel mill control panels—adding features to permit greater utilization of mill space . . . to save you time and money in installation and maintenance . . . and increase safety for operating personnel. The following cost-cutting and work-saving benefits tell the story of these new panels:

Reduced floor space—Compact design of this new panel cuts floor space needs up to 35 percent. More efficient arrangement of components provides added room for work inside the panel, yet reduces panel length. All incoming wires for control terminate at the front of the panel. All power wiring, including customer power connections, is isolated on the back rack. Use of welded studs and cage nuts permits installation against a wall —no need for additional work space behind panel. This saving in space means that valuable floor area can be used for other purposes, or construction costs of new buildings can be reduced.

Easier field connections—Installation wiring time is reduced as much as 50 percent by improved wiring layout. All incoming control wiring is brought to the front of the panel. A horizontal wire trough is available to the contractor to facilitate wiring to proper terminals and eliminate cord-tying bundles of wires in the field. Doors on the front of the panel open for access to terminal boards. For quick identification, terminal designations are permanently ingrained on the terminal board and into high-quality, plastic sleeves on each wire end.

Simplifed maintenance—Wide aisle between front panel and back rack makes maintenance easier and safer. Devices on front panel and back rack are connected *from the maintenance aisle,* allowing work from only



time 50%, required floor space 35%

one location. On the regulator package, fine-tuning adjustments are easier since potentiometers are located next to their related meters.

Increased safety—Since power wiring and all field power connections are isolated on the back rack, operating personnel are protected from accidental contact with high voltage. "Dead-front" construction, utilizing regulator packages and front panel devices behind doors, affords additional protection.

Improved appearance—All-steel bases provide rugged construction and uniform panel shape. Packaging of equipment into functional components and placement of contactors and relays behind doors give straight-line, modern appearance to panels.

For details on these steel-mill control panels, see your G-E Sales Engineer. Or write Sect. 785-13, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6701. *Industry Control Dept., Salem, Va.*

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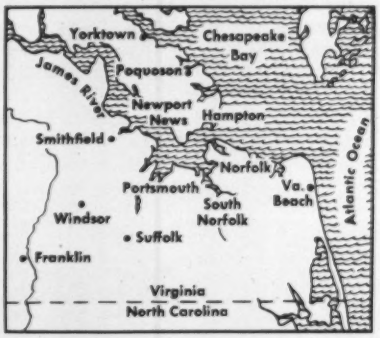

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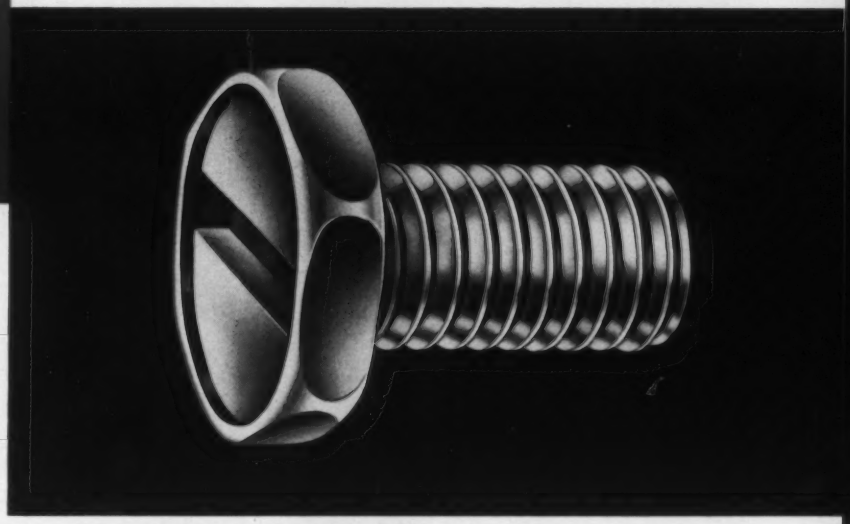

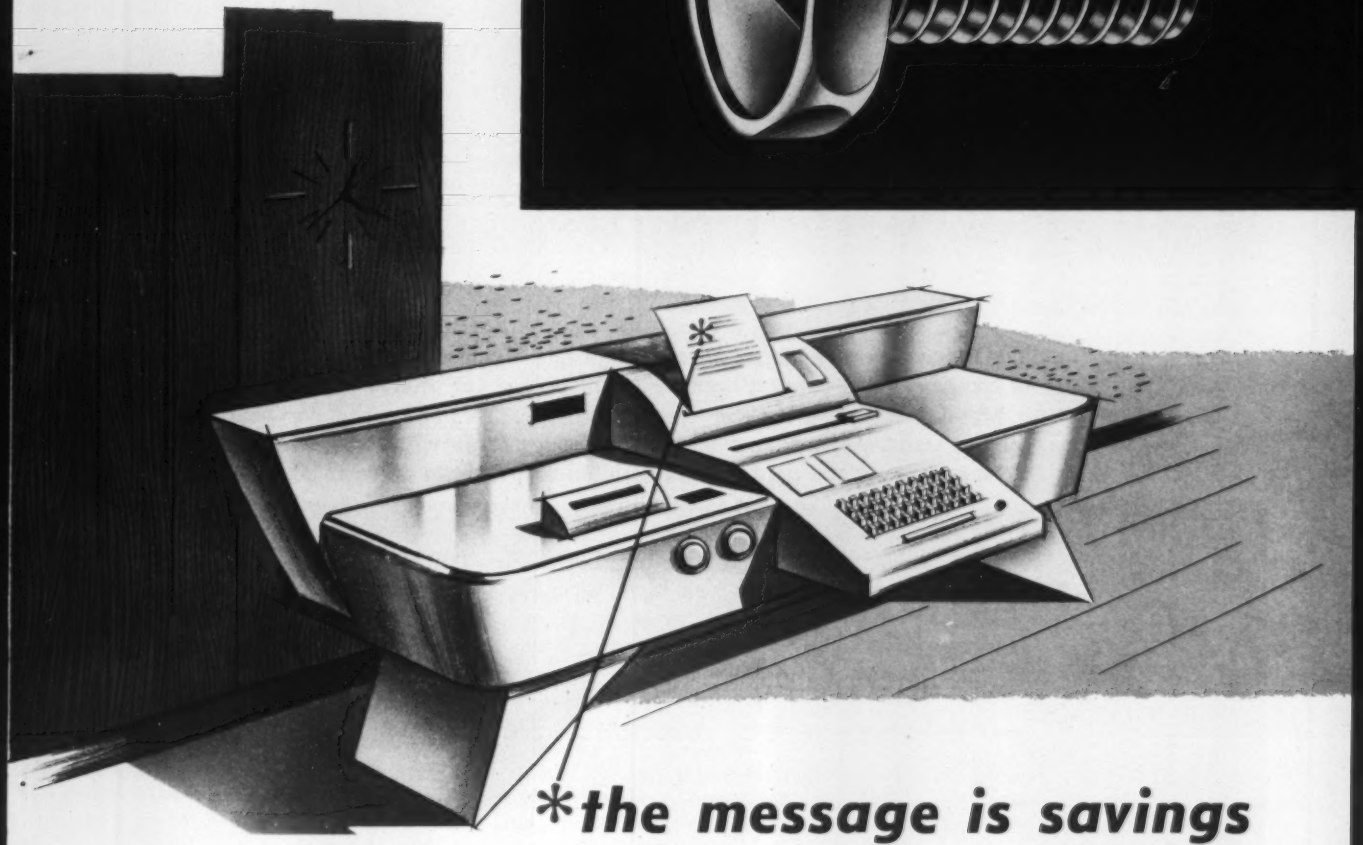

*the message is savings

Put *your* products in this picture . . . what we have done for others we can do for you. Only a few years ago the part pictured in the illustration was made on a screw machine because no one had ever successfully manufactured it by cold heading. The customer was paying a premium for this part and sacrificing strength in the process. GLS engineers reviewed the job and perfected the part to run quickly and perfectly on cold heading equipment. This customer benefited many ways. First, he was able to reduce his capital investment in screw machines. Second, he was able to release many dollars of raw material inventory. Next, the strength was increased due to cold forming. None of the original material was machined away as scrap. Therefore, he is buying the stronger cold headed part for less. Message? *The Message is savings.*

GSL

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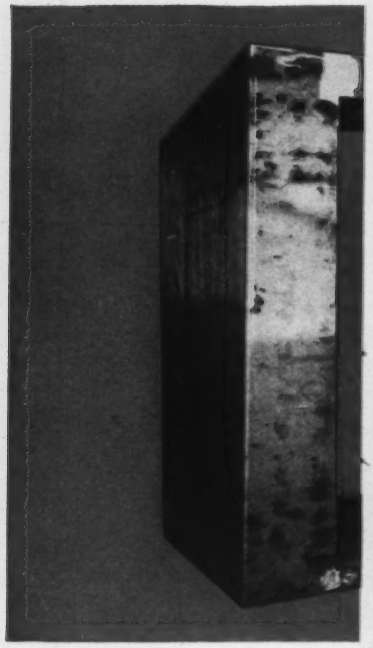
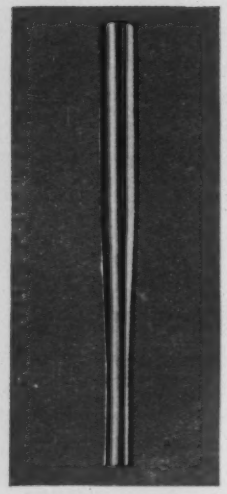


How METALOGICS* cools off the high-cost hot seat!

The following case histories are typical of how Ryerson Metalogics helps hundreds of companies save money, improve products, and cut production waste.

Metalogics-trained Ryerson specialists help you value-analyze cost-soaring production problems—and they back up their suggestions with unbiased recommendations on exactly the right steel, aluminum or plastic to do each job best for less.

Little wonder, then, that more and more companies across the country find the high-cost hot seat a little cooler after inviting a Ryerson man to value-analyze specific problems, and come up with recommendations. Give him a call—perhaps he can help answer some of your high-cost questions.



*METALOGICS—the Ryerson science of giving optimum value for every purchasing dollar.

PRODUCTION COSTS REDUCED 40%

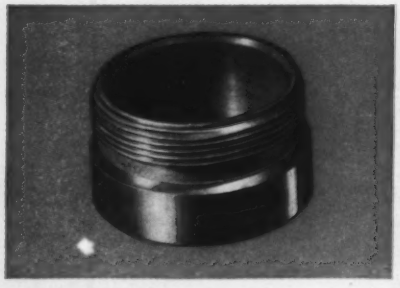
Company was making chrome-plated table legs as a 3-piece weldment and having problems in holding concentricity and making proper preparation for the mirror finish. In addition, production costs were high.

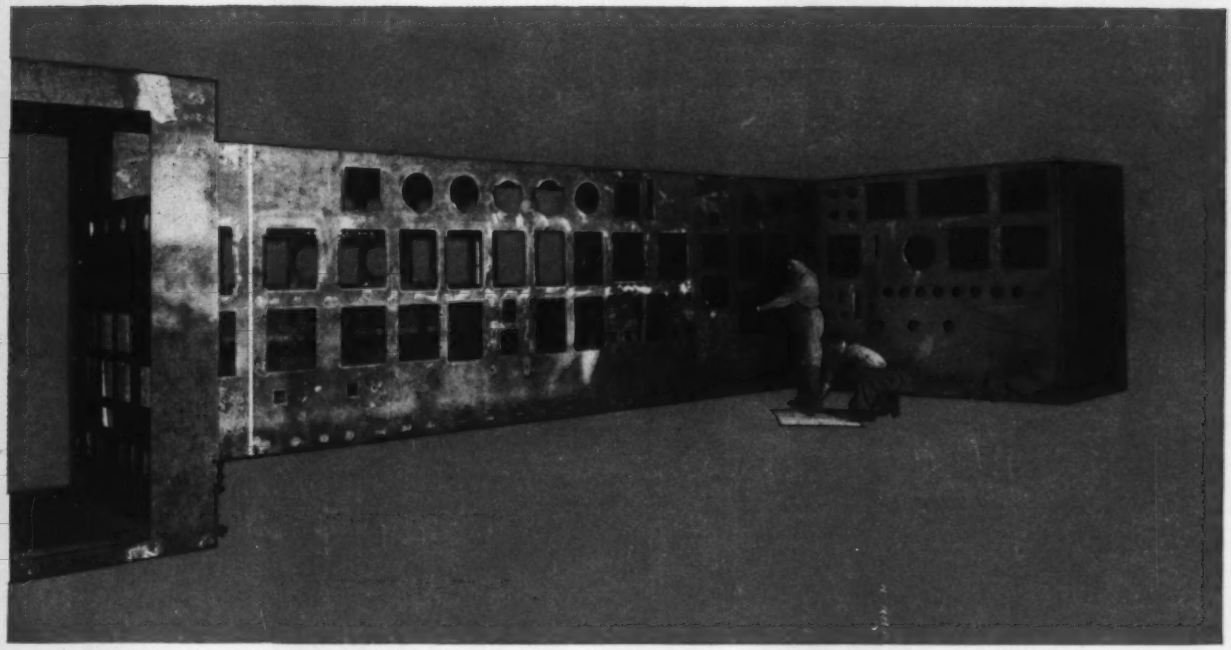
Ryerson recommended this Metalogical solution: make the legs from *one* piece of 3″ O.D. soft-annealed, cold rolled, electric-welded tubing—half the length tapered to 2″ O.D., holding concentricity to 1/32″. Results: surface was just right for chrome plating, and production cost reduced.

THREAD GALLING ELIMINATED

Manufacturer made this special coupling of aluminum to gain the advantages of light weight, corrosion resistance and easy machining. But a problem developed due to galling of threads.

Following the recommendation of a Ryerson Metalogics specialist, the company hard-coated the parts by special low-temperature anodizing which produced a surface hardness of Rockwell 70 C. Galling was eliminated, and corrosion resistance increased. One more example of top technical help from Ryerson.

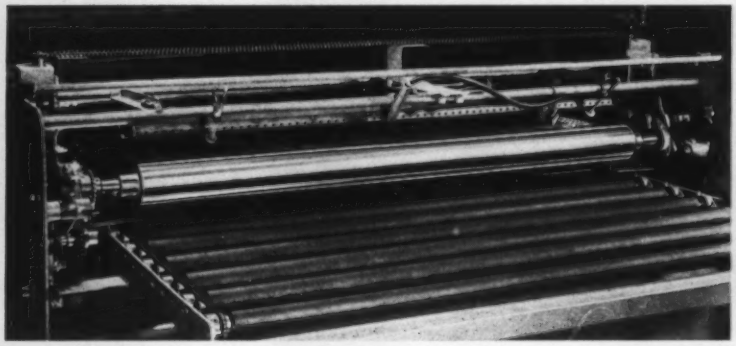


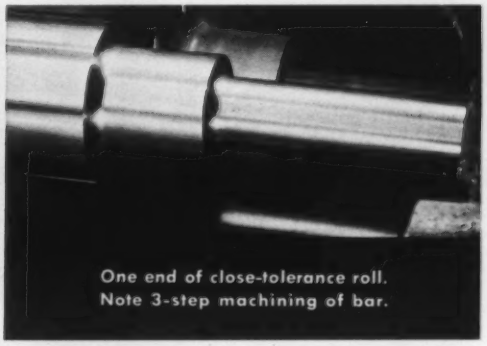


150 OPENINGS BURNED IN HUGE CONTROL PANEL ASSEMBLY

Expert Ryerson flame-cutters burned more than 150 openings in the steel plates that make up this huge control panel assembly.

Each opening had to be located and cut with extreme accuracy to permit proper installation of the complex instrument system. Distortion had to be carefully controlled and a high degree of flatness maintained so that the plates would have a good appearance when painted. All such requirements were readily met by Metalogically-oriented Ryerson service.





One end of close-tolerance roll. Note 3-step machining of bar.

SWITCH TO LEDLOY® STOPS TEARING...CUTS REJECTS

In making this roller coater—Gasway Corp., Chicago—was having trouble machining C-1018 bar stock to produce a close-tolerance roll. Three-step machining was required at both ends of the bar, and tearing was frequent with up to five stops per cut to regrind the tool.

After studying the problem carefully, their Ryerson specialist recommended a change to Ledloy 300. Results from this fast-machining leaded steel: higher production; longer tool life; rejects cut to a minimum.

Other steels for this coater, including angles, expanded metal, and cut-to-size side plates, are also supplied by Ryerson.

As P. A. Bill Vastine puts it, "Time and time again Metalogics takes me off the spot. It gives me technical help, plus convenient, dependable, single-source service on all my requirements."

RYERSON METALOGICS

JOSEPH T. RYERSON & SON, INC., MEMBER OF THE INLAND® STEEL FAMILY

STEEL · ALUMINUM · PLASTICS · METALWORKING MACHINERY

WHY PAY FOR METAL WASTE?

Here is how to cut costs on your next tube order... by eliminating excessive metal waste and unnecessary machining time.

NOW FOR THE FIRST TIME you can order the exact size tube O.D.'s you need from 2.25" to 50" with wall thicknesses from .25" to 8". An exclusive "first" in centrifugally spun tubing — the ACIPCO CERAM-SPUN® process* makes this revolutionary development possible.

YOU BUY WHAT YOU NEED... NO MORE. Furthermore, the cost of unwanted crop ends can be eliminated and tubes can be cast to specified lengths from 4 feet to 20 feet. Longer lengths are made by welding.

OTHER ADVANTAGES? ACIPCO's complete "under one roof" operations — including heat treating, machining and welding — save you the delays and excessive costs that often result in buying from multiple supply sources.

Let us tell you more about ACIPCO CERAM-SPUN® ... contact us today. ACIPCO STEEL PRODUCTS, Division of American Cast Iron Pipe Company, Birmingham 2, Alabama.

*Patent applied for

ACIPCO CERAM-SPUN®
STEEL TUBING

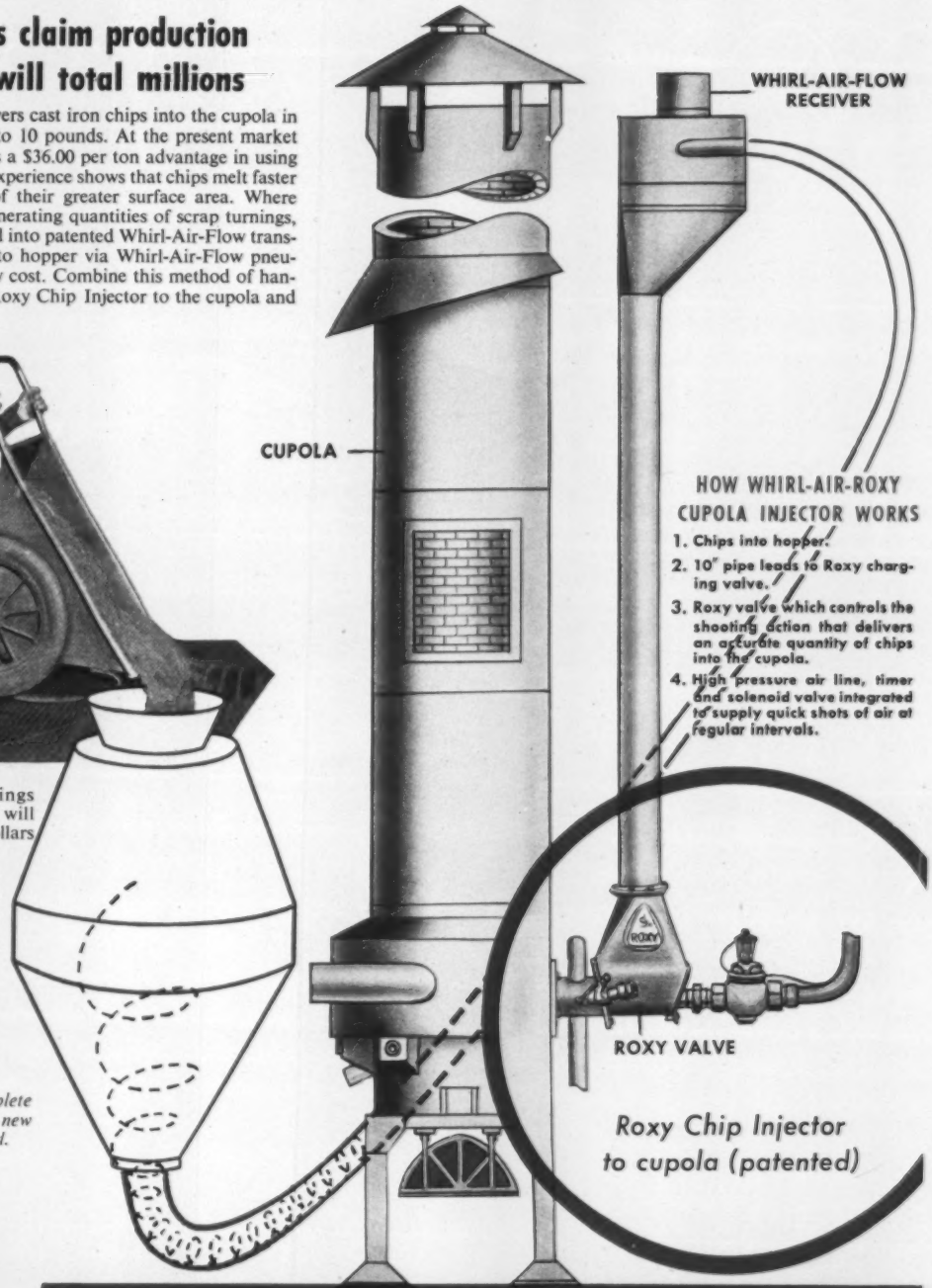
SAVE $36.00 a ton on cast iron chips

New Whirl-Air-Roxy method delivers chips from Machine Shop to Cupola *(patented)*

Foundries claim production savings will total millions

New Roxy valve delivers cast iron chips into the cupola in measured shots of 7 to 10 pounds. At the present market value of scrap there is a $36.00 per ton advantage in using chips. Also, foundry experience shows that chips melt faster than scrap because of their greater surface area. Where machine shops are generating quantities of scrap turnings, they can be discharged into patented Whirl-Air-Flow transporter and delivered to hopper via Whirl-Air-Flow pneumatic conveyor at low cost. Combine this method of handling chips with the Roxy Chip Injector to the cupola and you will achieve savings that foundrymen say will amount to a million dollars in very few years of operation. The Whirl-Air-Roxy method is easily applied to any size foundry; small, medium or large. Initial cost is low and savings will pay for installations in a period of a few months. We invite your exploratory inquiry.

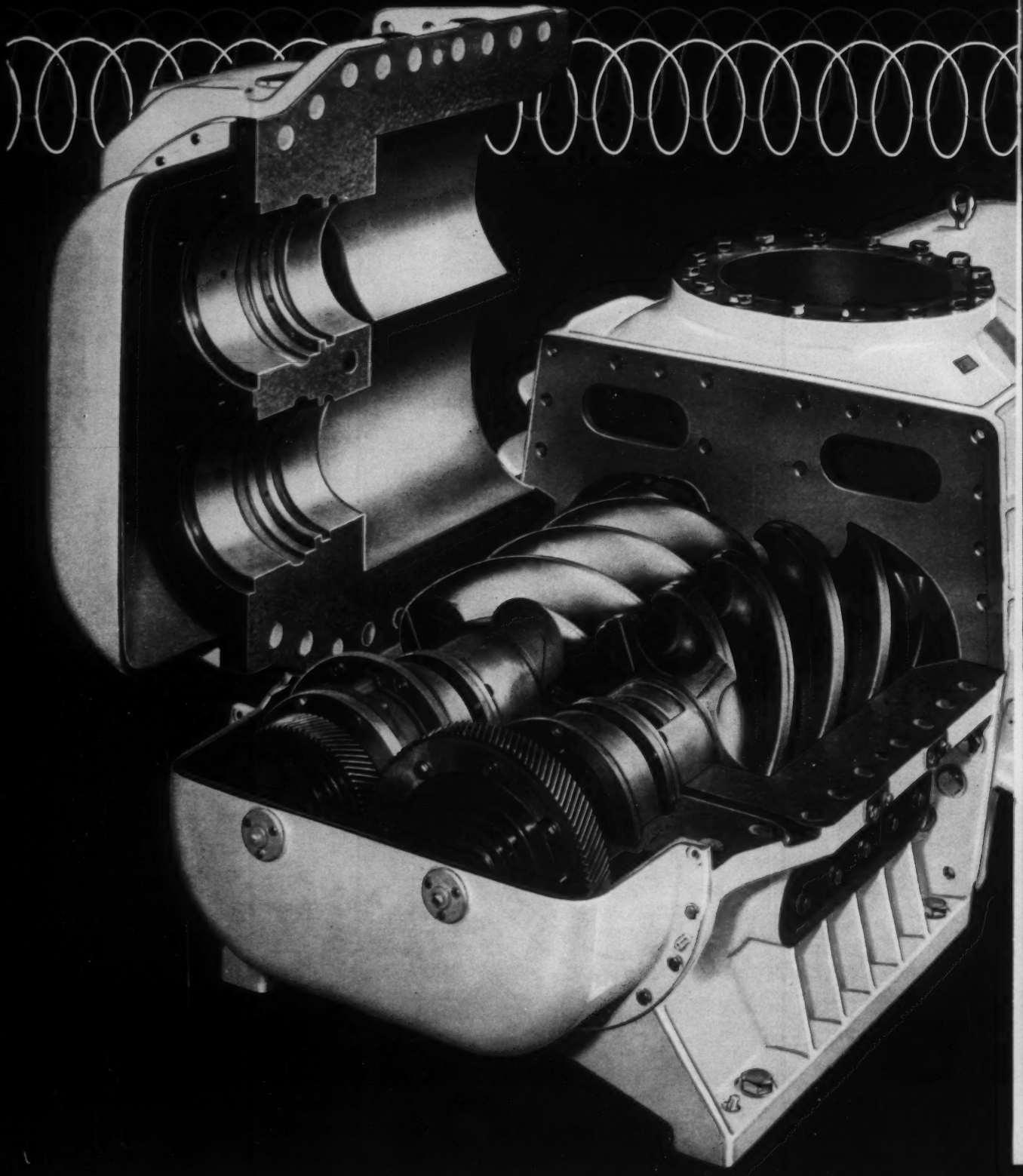
Write or wire for complete information on the new Whirl-Air-Roxy method.


WHIRL-AIR-FLOW RECEIVER
CUPOLA
HOW WHIRL-AIR-ROXY CUPOLA INJECTOR WORKS
1. Chips into hopper.
2. 10" pipe leads to Roxy charging valve.
3. Roxy valve which controls the shooting action that delivers an accurate quantity of chips into the cupola.
4. High pressure air line, timer and solenoid valve integrated to supply quick shots of air at regular intervals.
ROXY
ROXY VALVE
Roxy Chip Injector to cupola (patented)

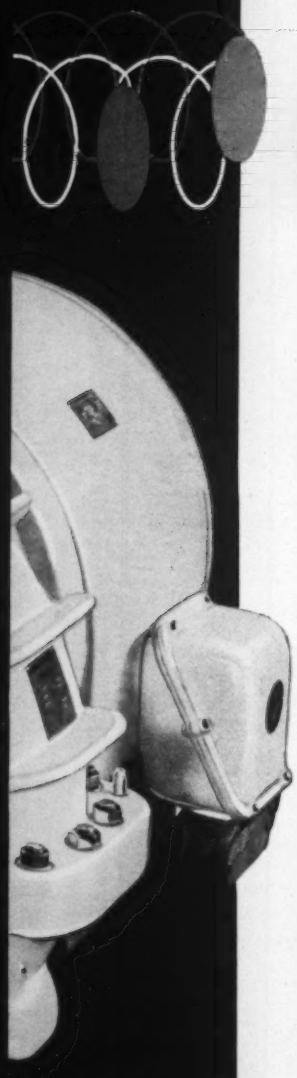
WHIRL AIR FLOW PNEUMATIC CONVEYORS

WHIRL-AIR-FLOW

MORE BLUE CHIP COMPANIES BUY F-M COMPRESSORS...



BECAUSE MECHANICAL SIMPLICITY MEANS FAR LESS COST!



F-M ROTARY COMPRESSORS

More and more, industrial leaders are looking-to (and buying) Fairbanks Morse leadership in Compressor design. Why? Because the unique, mechanical simplicity of this *rotary* design combines maximum efficiency and reliability with low initial cost—low maintenance requirements—minimum operating costs. *And skid-mounting* cuts installation time—puts you on stream faster.

The advanced design of the F-M Axial Flow Rotary Compressor features *helical-shaped* rotors for smooth, economical compression . . . with oil-free delivery, surge-free operation on a wide variety of gases.

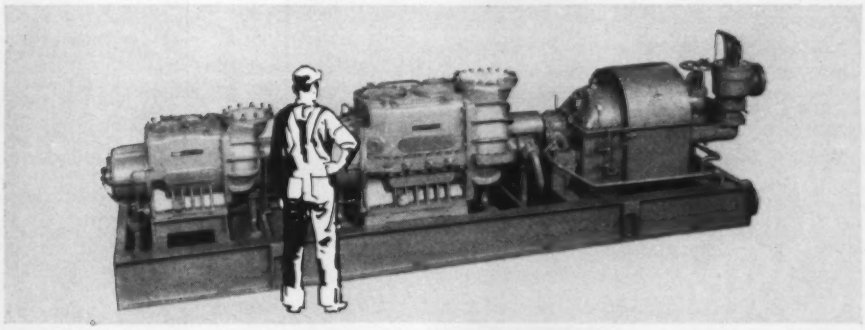
F-M Rotary Compressors have no reciprocating parts, no valves, no metal-to-metal contact in the compression chamber. Result? Minimum "down-time" expense. They save space—produce minimum vibration—provide stable performance with speed flexibility. Every Rotary Compressor built features famous Fairbanks Morse quality craftsmanship.

With capacities up to 21,000 cfm—and pressures up to 250 psig, F-M Rotary Compressors are a versatile asset to many operations. Discover how they can step up the efficiency of *your* operation . . . and cut maintenance and installation costs as well. Write: **Fairbanks, Morse & Co., Director of Marketing, Compressor Division: Beloit, Wisconsin.**

THESE INDUSTRIAL LEADERS HAVE BOUGHT F-M LEADERSHIP IN COMPRESSOR DESIGN!

(What Benefits Them Can Benefit YOU)

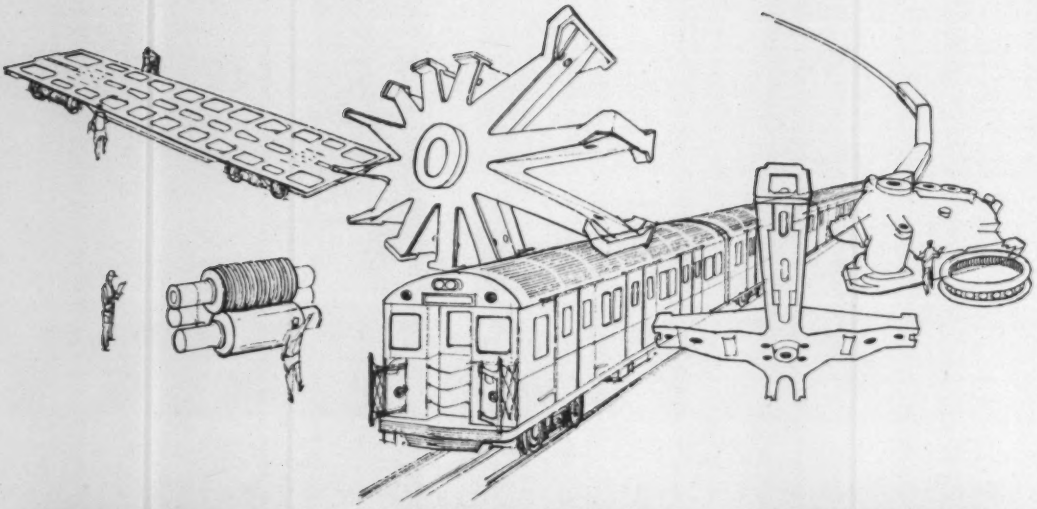
The Algoma Steel Corporation, Limited
American Metal Climax, Inc.
C F Braun & Co.
Celanese Chemical Co.
Copolymer Rubber & Chemical Corp.
Cyanamid of Canada, Ltd.
Deere & Company
Foster Wheeler Corporation
M. W. Kellogg Co.
Monsanto Chemical Co.
The Ralph M. Parsons Company
Phillips Chemical Co.
Scientific Design Co., Inc.
Shell Chemical Company
St. Paul Ammonia Products Co.
Union Carbide Chemicals Company
United Refining Co.



Skid-Mounted, Tandem Rotary Compressor ready for installation at Deere & Company, Waterloo Tractor Works.

Model 200L3/132L3 Fairbanks-Morse Rotary Air Compressor for 12,000 cfm, 110 psig. with 2600 h.p. steam turbine drive.

FAIRBANKS MORSE
A MAJOR INDUSTRIAL COMPONENT OF
FAIRBANKS WHITNEY



GSI

. . . a New Mark of Action

General Steel Castings Corporation has changed its name to General Steel Industries, Inc., to reflect its growing diversification.

Today, the General Steel organization includes:

GENERAL STEEL INDUSTRIES

A major supplier of large and small steel castings for railroad and rapid transit cars, and industrial, utility, military, marine and nuclear equipment.

NATIONAL ROLL & FOUNDRY DIVISION

Producer of a wide range of steel, iron and nodular iron rolls for the steel industry.

ST. LOUIS CAR COMPANY

Acquired as of June 30, 1960 by General Steel, St. Louis Car is a leading builder of transportation, ground support and defense equipment.

General Steel now offers you greater capability than at any previous time in its history. We invite your appraisal.

GENERAL STEEL INDUSTRIES

Granite City, Ill. · Eddystone, Pa. · Avonmore, Pa.

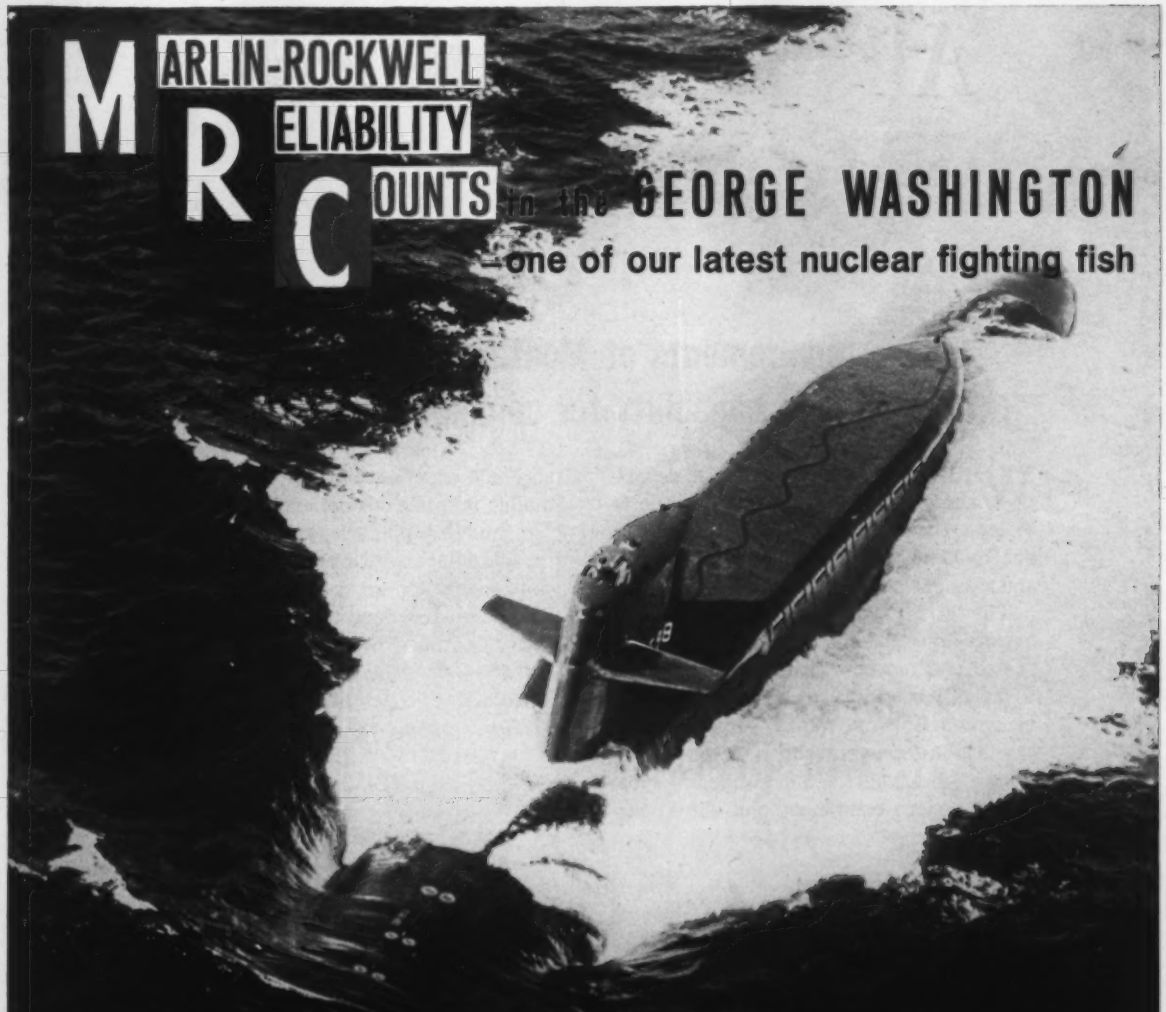
ST. LOUIS CAR COMPANY

Saint Louis 15, Missouri, A Subsidiary

MARLIN-ROCKWELL RELIABILITY COUNTS

in the GEORGE WASHINGTON

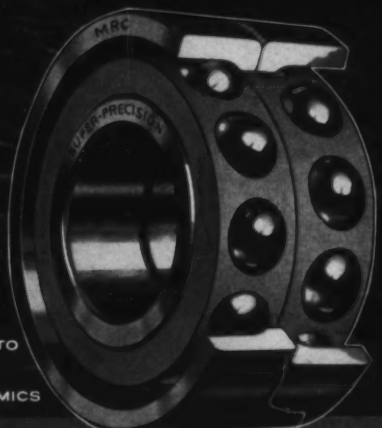
—one of our latest nuclear fighting fish



MRC Engineers, working with the country's leading electric motor manufacturers, have developed the world's quietest, smoothest running and vibration-free bearings for use in the electric motors of our nuclear powered submarines.

While most applications do not require bearings with such extremely close tolerances, the techniques developed to produce these highly successful bearings are employed in manufacturing other bearings to tolerance levels commensurate with the equipment in which they are to be used.

These achievements have contributed greatly to the general overall performance expectations of all types of bearings for any critical applications.



OFFICIAL
U. S. NAVY PHOTO

ship built by
GENERAL DYNAMICS

Consult OUR Engineering Department on YOUR Bearing Problems

MRC
BALL AND ROLLER *bearings*

MARLIN-ROCKWELL CORPORATION

Executive Offices: Jamestown, N. Y.

All the air problems of this solved with *one system*

Unique requirements of Montana State structure point up AAF's capability for complete air engineering

WHEN you decide to house the departments of Zoology, Wild Life, Microbiology, Bacteriology and Public Health in one building, you know that some special and unusual air problems must be solved.

The air in Montana State's Health Sciences Building had to be cleaned, cooled, heated and moved—all in varying degrees to meet the special needs of animal environment and isolation rooms, surgery rooms, sterile transfer rooms and research labs.

The job called for many different types of component equipment plus the knowledge and experience to coordinate its functioning into one custom-engineered system. The building planners turned to AAF—the one company that provides all the major components for an engineered air system. Result: one system of completely conditioned air . . . one responsibility for its performance.

Booklet 518 describes the complete line of AAF component products. For a free copy, address Mr. Richard Smith, American Air Filter Company, Inc., 443 Central Avenue, Louisville, Kentucky.

American Air Filter

BETTER AIR IS OUR BUSINESS

AIR CLEANING: (Atmospheric Dust) AAF electronic air cleaners, viscous impingement filters, *dry-type filters,* engine & compressor filters. (Process Dust) electrostatic precipitators, wet-type collectors, dry-type collectors, fabric arresters. AIR CONDITIONING, HEATING & VENTILATING: Herman Nelson *air conditioning unit ventilators,* unit ventilators, portable heaters; Kennard/Nelson dual-duct air conditioning units, *multi-zone air conditioning units,* packaged central station air handling units, sprayed-coil dehumidifiers, *fan-coil units, packaged liquid chillers, cooling towers,* evaporative condensers, direct-expansion coils, water coils, steam coils, unit blowers, industrial exhausters, centrifugal fans, unit heaters, radiation products; Illinois traps, valves, specialties, heating systems and controls.

● *Italics denote products used in Health Sciences Building*

HEALTH SCIENCES BUILDING, Montana State University, Missoula, Montana. Architects & Engineers: Witwer & Price, Missoula; Structural Engineers: Lyerla & Peden, Spokane, Washington; Electrical Engineers: James F. Parr, Hamilton, Montana; Mechanical Contractor: Reber Plumbing & Heating, Helena, Montana.

university building from *one source...*

AAF

AIR CLEANING PRODUCTS
Air Filters
Dust Collectors

AIR CONDITIONING, HEATING & VENTILATING PRODUCTS

COMPLETELY CONDITIONED AIR

"3M" TYPE "C" DISCS CUT GRINDING TIME 1/3!

At a 3M representative's suggestion, Mastercraft Metals, Inc., Bellevue, Ky., a leading manufacturer of stainless steel kitchen equipment recently switched from a competitive brand to 3M Type "C" Discs for grinding welds. The result: a ⅓ reduction in grinding time . . . and Type "C" Discs produce a finer scratch pattern that allows easier, faster blending to the final finish.

COST CHECK 5-4-5

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase profits. Discover . . .

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form without obligation. Put 3M's years of abrasive know-how at your disposal. Write: 3M Company, 900 Bush Ave., St. Paul 6, Minn. Dept. No. ABH-31.

3MAGINATION in GRINDING and FINISHING

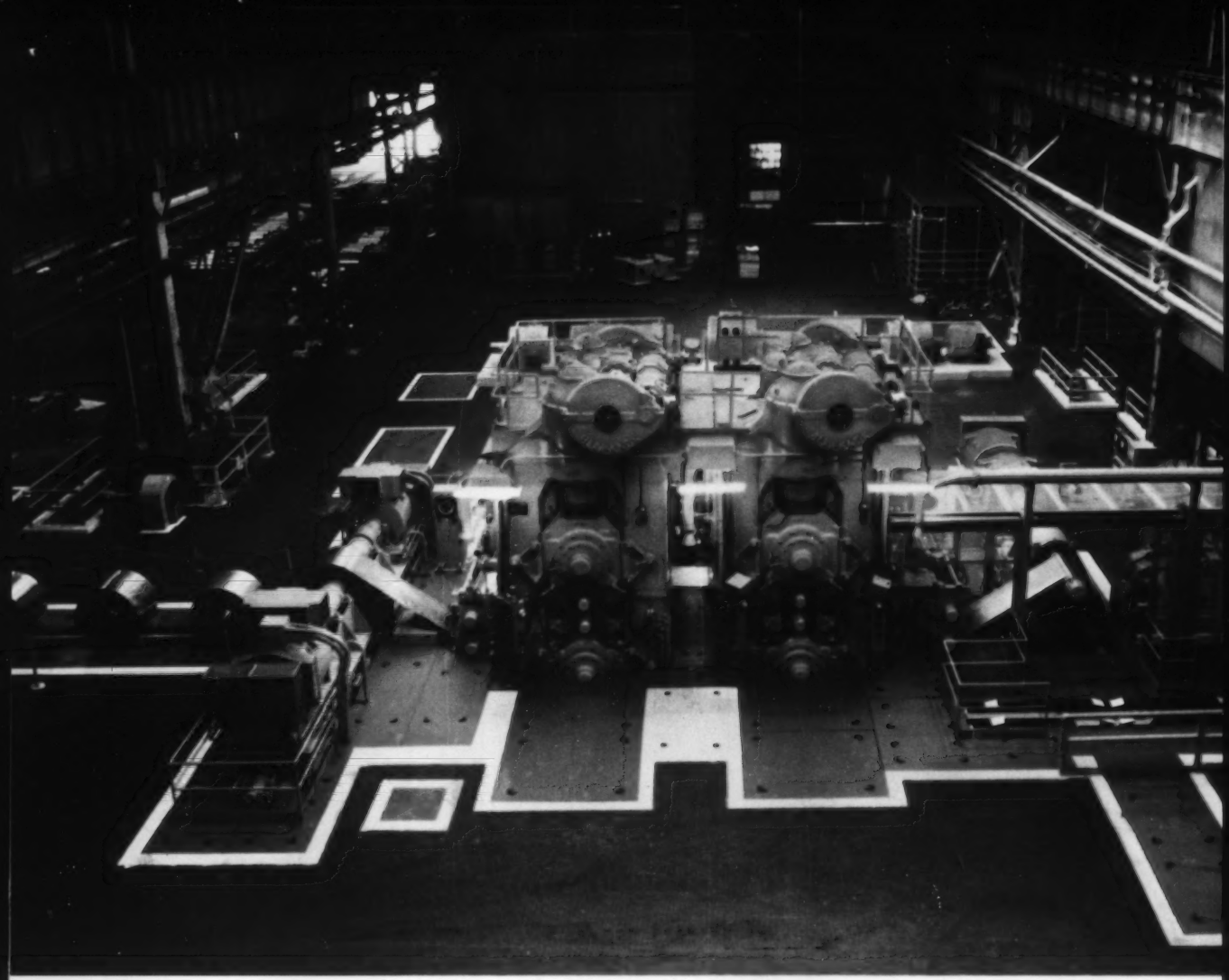
COATED ABRASIVES DIVISION

"3M" IS A REGISTERED TRADEMARK OF 3M CO., ST. PAUL 6, MINN.

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M



19- and 53-inch x 48-inch high speed 2-stand Temper Mill.

BLAW-KNOX TEMPER MILLS

Blaw-Knox designs and builds a full range of two high and four high Temper Mills for integration into sheet, strip, and tin plate processing operations. Other Blaw-Knox equipment for the metals industry includes complete rolling mill installations and auxiliary equipment for ferrous and non-ferrous metals, sheet and strip processing equipment, electrolytic tinning, annealing, and galvanizing lines, seamless pipe and tube mills, draw benches, and cold draw equipment, Blaw-Knox Medart cold finishing equipment, iron, alloy iron and steel rolls, carbon and alloy steel castings, fabricated steel plate or cast-weld design weldments, steel plant equipment, and heat and corrosion resisting alloy castings. Blaw-Knox Company, Foundry and Mill Machinery Division, Blaw-Knox Building, 300 Sixth Avenue, Pittsburgh 22, Pa.

BLAW-KNOX

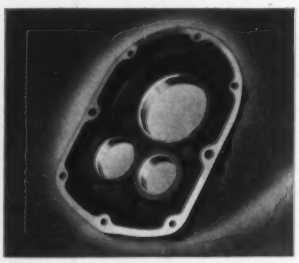
Blaw-Knox designs and manufactures for America's growth industries: METALS: Rolling Mills • Steel Processing Lines • Rolls • Castings • Open Hearth Specialties • PROCESSING: Process Design, Engineering and Plant Construction Services • Process Equipment and Pressure Piping • CONSTRUCTION: Concrete and Bituminous Paving Machines • Concrete Batching Plants and Forms • Gratings • AEROSPACE: Fixed and Steerable Antennas • Radio Telescopes • Towers and Special Structures • POWER: Power Plant Specialties and Valves

...the quality-engineered package

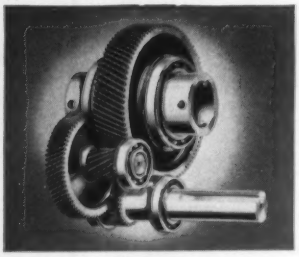
that simplifies speed reduction

DODGE TORQUE-ARM, America's most widely used shaft mounted speed reducer, will save money for *you*. No foundation, no sliding motor base, no flexible coupling, no installation fuss. Developed and perfected by Dodge, this reducer has been so widely accepted in industry that it is now built and stocked in this unmatched range of sizes and models: capacities up to 170 hp; output speeds from 10 to 400 rpm; ratios of 5:1, 15:1, 25:1; speed ratios up to 175 to 1 with correct selection of speed reducer and V-belt drive. Built-in backstop available. Also positive overload release. Vertical models. Flange mounted models. Special application models . . . Go modern—go Torque-Arm! See your Dodge Distributor, or write us.

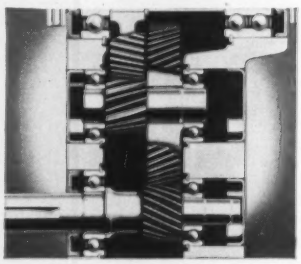
Dodge Manufacturing Corporation, 4400 Union St., Mishawaka, Ind.



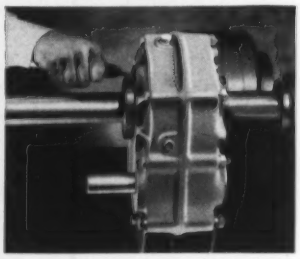
Rugged, semisteel housing holds bearing seats in line for entire life of unit. Laughs at loads. Corrosion resistant.



AGMA rated helical gears. Soft cores withstand shock; hardened surfaces defy wear. Teeth are crown shaved.



Gears are located *between* bearings and carry their loads without strain. Longer life, higher efficiency.



Unit slides completely onto shaft and locks on *both* sides of housing. This baby stays *put*—runs truer longer.

The Products with the Pluses... **DODGE**

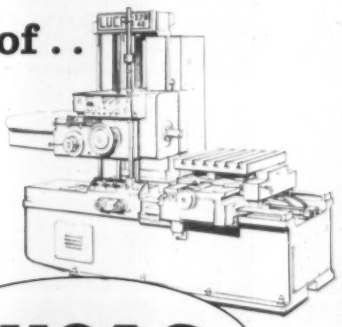
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge he can give you valuable assistance on new cost-saving methods.

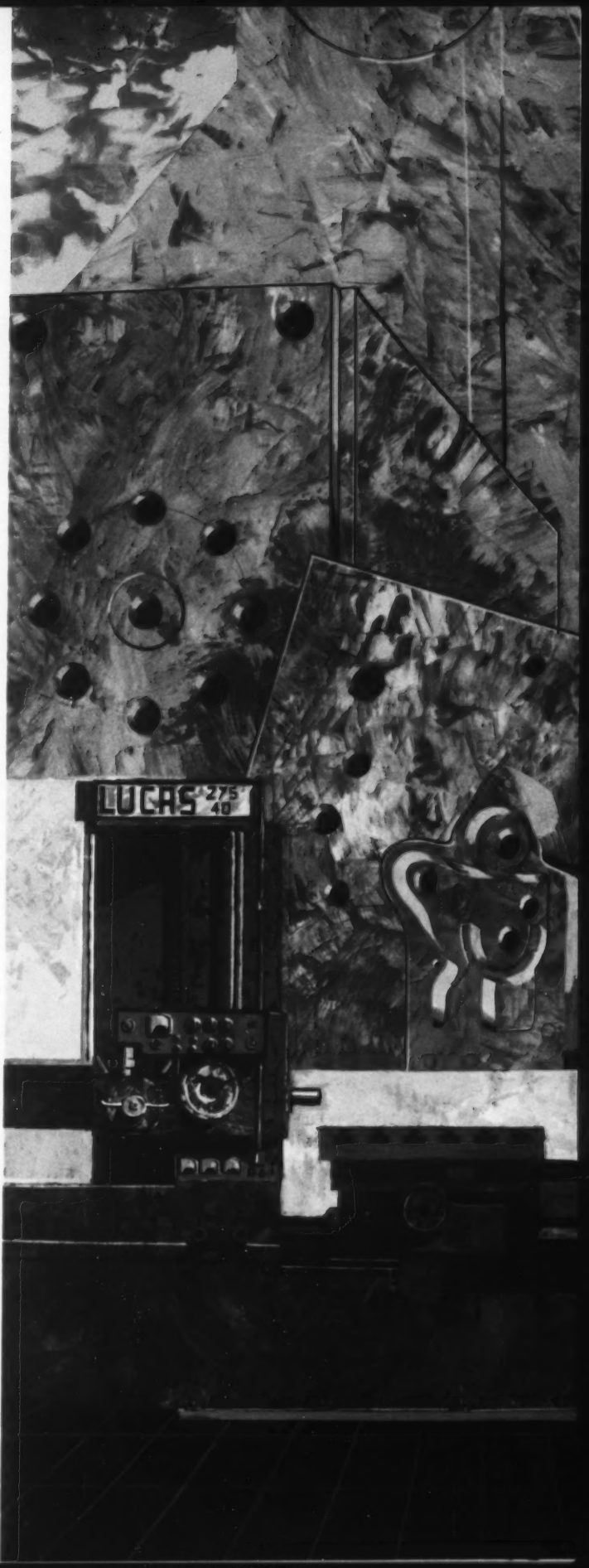
±.0001 accuracy
Versatility unlimited
Small size

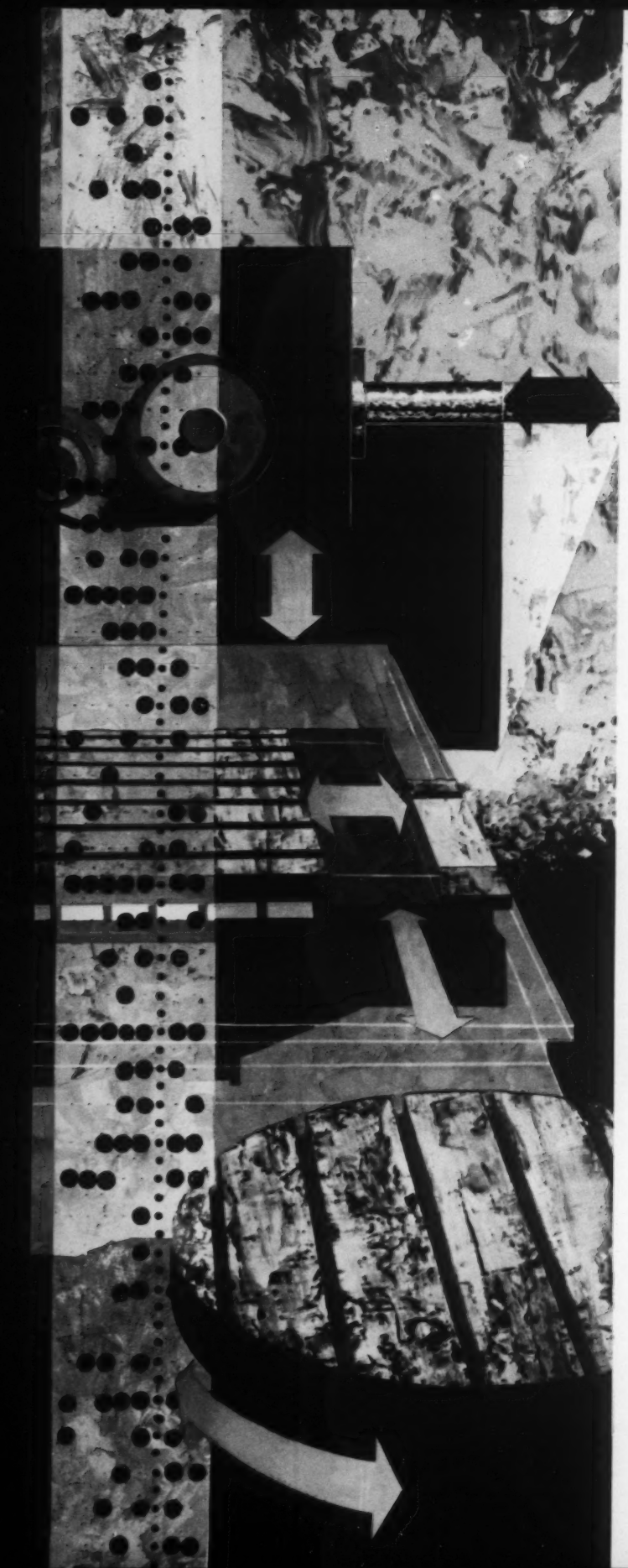
The new Model 275-40 presents every famous Lucas feature, *including saddle feed*, compacted into a 2¾″ spindle machine specially suited for small, precision work. Any way you look at it, this new Lucas has the size and the machining versatility to fit into your shop or tool room setup. It's a truly profitable machine because it has so much and does so much. You get a built-in rotary table, tape programming if you want it, extreme accuracy for close tolerance machining and on-machine inspection, a new simplified control system, and many other features. Your Lucas representative can give you the whole story and arrange a demonstration right at the Lucas plant if you wish. Contact him or write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of precision machining small, intricate pieces . . .

think of . .



LUCAS
PRECISION



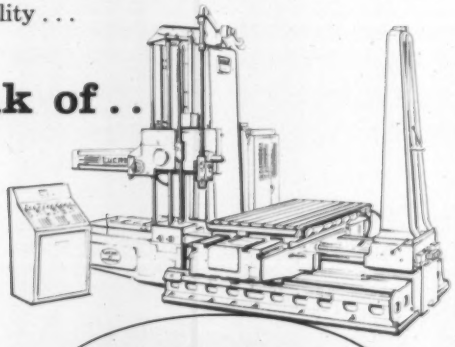


When you think of PROFITABILITY

. . . think of Lucas and tape. They're made for each other. Here's why. The Lucas machine can do more horizontal boring, drilling and milling work better than any other machine on the market. Couple this basic efficiency of a Lucas with the cost savings and reliability of tape control and you have an unbeatable combination for profitable work of the highest precision.

Lucas has applied numerical controls to its full range of boring, drilling and milling machines for a number of years. The various combinations of controls available have all been successfully applied by some of the most knowledgeable metalworking firms in the country. Your Lucas representative can discuss in detail some very interesting case histories and arrange a demonstration for you. Contact him or write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of profitability . . .

think of . .



LUCAS
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LET MUELLER MAKE IT!

Mueller Brass Co. of Port Huron is much more diversified than the name "Brass" implies . . . a lot more. In fact, because of its many and varied facilities . . . its *men, methods* and *metals* . . . Mueller is in the unique position of being able to offer true single source service.

MUELLER HAS THE MEN . . . experienced engineers with the ability to work out, creatively, tough design problems, and improve a part or components for production by the most economical method. You get sound engineering plus 44 years of practical metalworking production experience when you "Let Mueller Make It".

MUELLER HAS THE METHODS . . . when you "Let Mueller Make It", you are utilizing one single source that is able to produce parts any one of these ways: as forgings, impact extrusions, sintered metal parts, screw machine products, formed tube or as castings.

MUELLER HAS THE METALS . . . and the materials . . . to produce precision parts in aluminum, brass, bronze, copper, iron and steel in hundreds of different alloys to meet each exact requirement.

In addition, Mueller Brass Co. has complete and modern facilities for performing all types of finishing and sub-assembly operations. Another plus value is nation-wide sales engineering service.

So, in the final analysis, no matter where you fit in the American industrial picture, whether you're making missiles or mowers . . . and no matter where you're located, it will pay you to LET MUELLER MAKE IT!

MUELLER BRASS CO. PORT HURON 26, MICHIGAN

See Us At Booth 701—Design Engineering Show—Cobo Hall, Detroit, May 22-25

340

YOU CAN ADD THIS ENGINEERING TEAM TO YOUR STAFF WHEN YOU

LET MUELLER MAKE IT!

When you work with the Mueller organization, a qualified team of trained, experienced and imaginative engineers automatically become part of your staff and go to work for you. This engineering team, which includes specialists in all categories of design work and production procedures, carefully considers all aspects of your particular part or assembly and its function. In conjunction with members of your engineering department, Mueller engineers can help design or re-design your part for improved performance, eliminate, where possible, unnecessary parts through re-design by making two or three part assemblies as a single piece, and recommend the best method of production. Mueller people also consider ways of speeding your finishing and assembly operations. Production economies consistent with product quality are always a prime consideration.

This TOTAL CONCEPT engineering service, which costs no more, is available to you when you . . . LET MUELLER MAKE IT!

MUELLER BRASS CO. PORT HURON 26, MICHIGAN

See Us At Booth 701—Design Engineering Show—Cobo Hall, Detroit, May 22-25

A practical approach to quenching

The three most common media used for quenching steel are water, brine and oil. Water offers rapid cooling, good hardness, penetration and low cost but may cause quench cracks. And it rates low in uniformity and size retention. Brine is even faster than water. It removes heat more uniformly but it, too, produces distortion and quench cracks. Oil is milder. It does not remove heat as fast as water or brine, but will minimize distortion and cracking.

Generally speaking, plain carbon steels require a high cooling rate such as that of water or brine for maximum hardness. Most alloy steels require a lower quenching speed for hardening, with some high alloy steels, such as high-speed tool steel, hardening fully in air.

Thus, the determination of what quench to use depends on the steel analysis, the quenching speed the specific steel requires, and the physical properties called for in the finished part. As a guide, here are six distinct quenchants developed and produced by Houghton. They provide full coverage of the complete range of cooling speeds called for by various steel analyses and the physical properties required in the part:

1. A **high-speed oil** that quickly quenches critical alloy steels for maximum hardness.
2. **A general purpose oil** that provides adequate hardness, superior toughness and low distortion in a wide range of alloy steels.
3. **A martempering oil** which can be maintained at 350°F. for long periods. For interrupted quenching to provide toughness and close size tolerance.
4. **Molten salt** for interrupted quenching at temperatures up to 1000°F. . . . for martempering, austempering and patenting.
5. **An additive for water** to minimize quench cracks.
6. **A concentrate** for addition to tanks of 100° paraffine oil to improve stability and accelerate the quenching rate.

If you are looking for improved physicals, better heat treat uniformity or fewer rejects, you can get experienced advice from Houghton—a leader in metallurgy for more than 50 years.

COMMON-SENSE QUENCHING HINTS

1. Provide oil circulation so that all surfaces of parts to be quenched are exposed uniformly to the oil. Containers should be baffled. Avoid nesting of work.
2. When installing cooling coils, the water in the coils should run counter-flow to the oil to provide maximum temperature differential.
3. The quench tank should be equipped with a tight cover and a CO_2 extinguisher handy in case the oil should catch fire.
4. Avoid use of baskets in quenching where possible. It is better to drop small parts on a screen which can be lifted out of the bath. Basket congestion hinders uniform cooling.
5. Avoid temperature variation when water is the quenching medium. Hold to 20° maximum spread.
6. Distortion and quench cracks can be minimized by removing the work from the quench before it reaches the temperature of the fluid.
7. It is advisable to temper **immediately** after quenching to relieve stresses and avoid quench cracks.
8. Wherever possible oil quenched work should be cleaned prior to tempering in salt to minimize salt contamination.

Your nearby Houghton representative will gladly give you detailed information and help in analyzing your problem and recommending the quench best suited to your need. Call him or write for a copy of "Houghton on Quenching". E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

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Cut metal cleaning costs with blasting

Pressure blasting with Norton ARROW-BLAST abrasive will save money every step of the way on most of your metal cleaning jobs — because of the high cutting efficiency and longer life of ARROW-BLAST grain. Composed of fused alumina grains that are tough, hard and sharp, ARROW-BLAST abrasive has high resistance to breakdown so that it can be used repeatedly through several cleaning operations. And unlike sandblasting, dust is negligible with ARROW-BLAST abrasive eliminating poor visibility and other hazards.

Norton NORBIDE* pressure blast nozzles add even more to the savings picture. Molded of boron carbide, the man-made material that's next to diamond in hardness, these nozzles have proven over and over that they have much lower overall operating cost than so-called "inexpensive" nozzles. NORBIDE nozzles cut costs right down the line — in replacement . . . operator downtime . . . air consumption.

An informative new report from Norton entitled "Pressure Blasting with Manufactured Abrasives," gives many details and operating facts about this efficient and economical metal cleaning process. For your copy, write NORTON COMPANY, General Offices, Worcester 6, Mass.

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G-411

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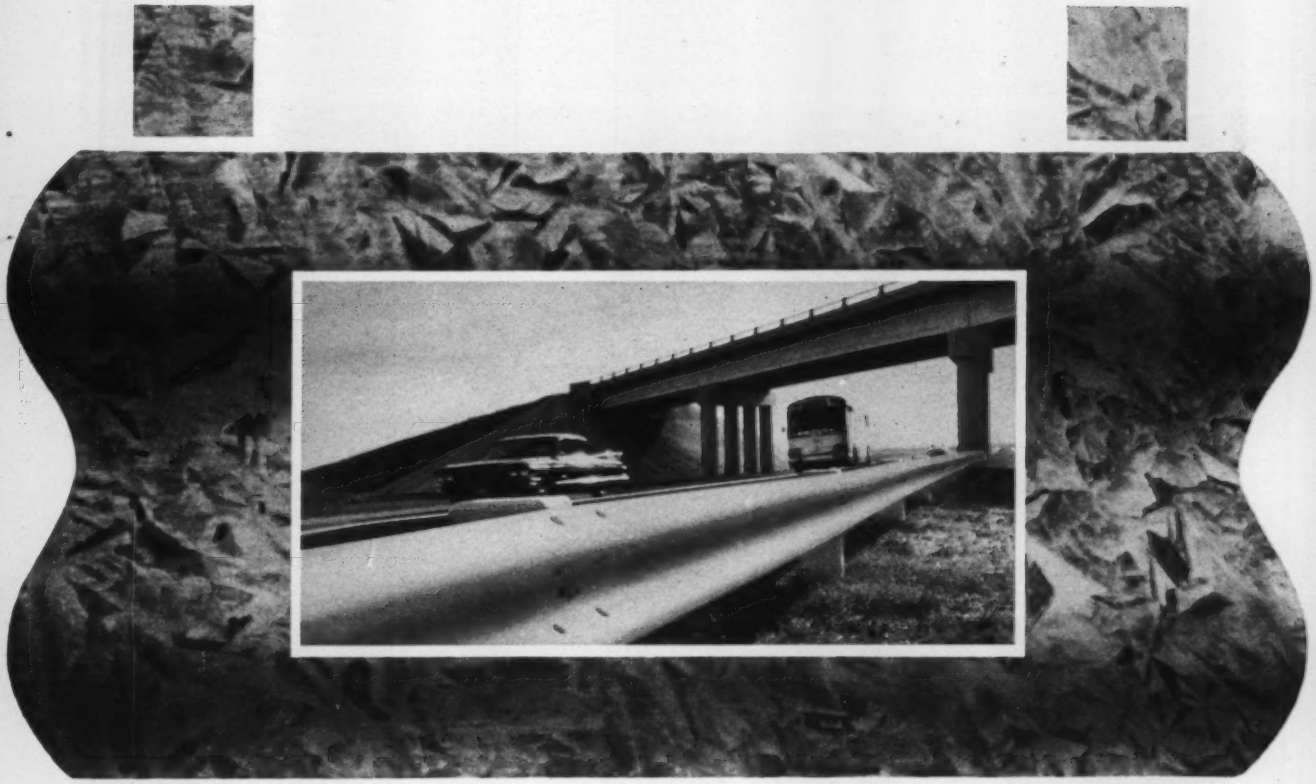
Stand-up-ability—strong reason why more and more roads are . . .



GUARDED BY GALVANIZED STEEL

Guard rails of galvanized steel are gaining favor . . . fast! Big reason: stand-up-ability . . . a neat knack of holding the line not only against impact, but also against the more gradual gnawing away that is done by time and the elements. From their inner steel core to their outer zinc coat, galvanized guard rails and median barriers stand up long and strong to deliver topmost protection with minimum cost and upkeep.

WEIRKOTE® IN PARTICULAR—You gain when you specify long-life galvanized steel for your guard rails. And you gain even more when you specify National Steel's Weirkote. To the inherent strength of steel, Weirkote adds *enduring* zinc protection. Weirkote is manufactured by two National Steel divisions, Weirton Steel and Midwest Steel. For complete details write Weirton Steel Company, Weirton, West Virginia.

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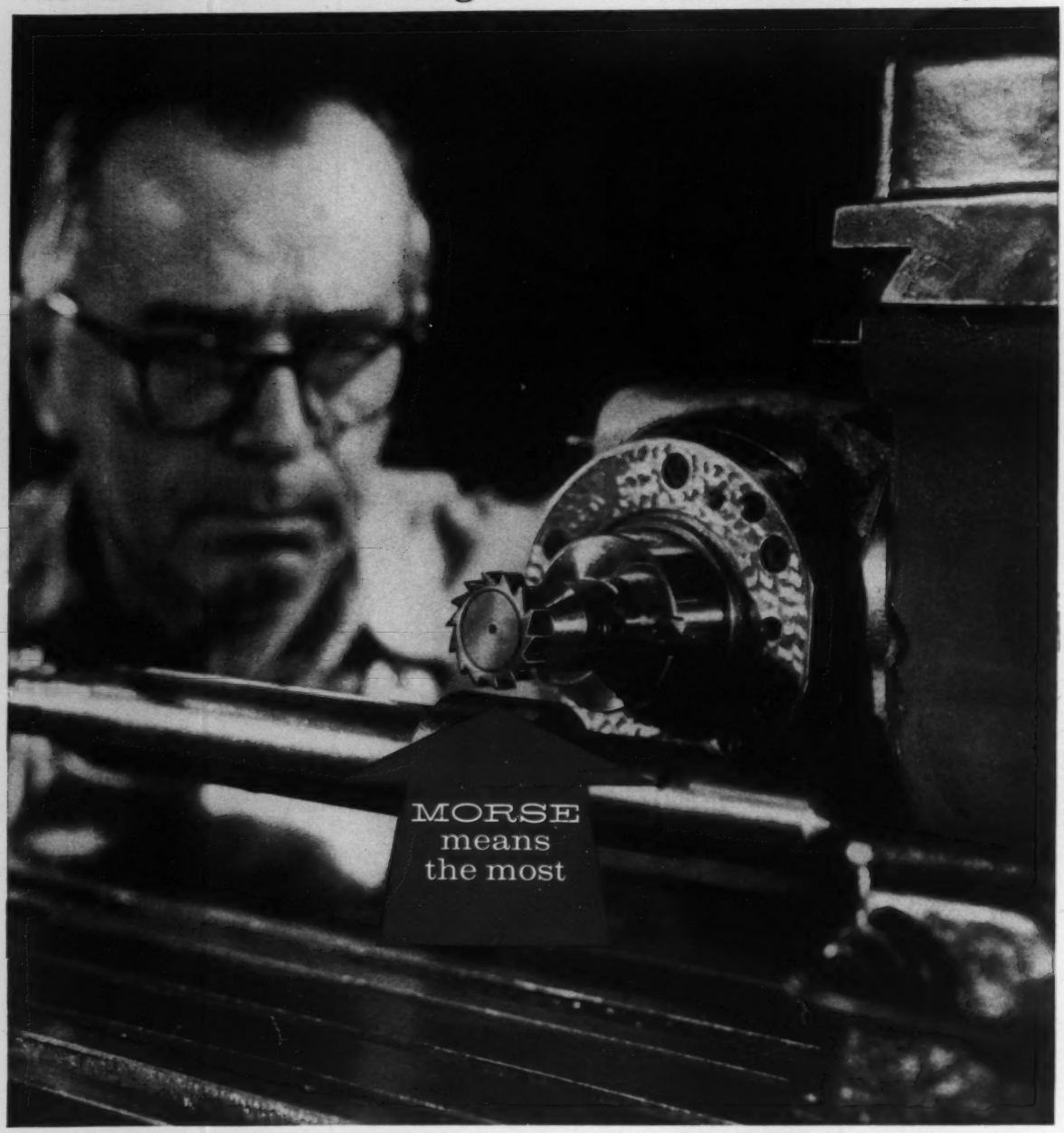

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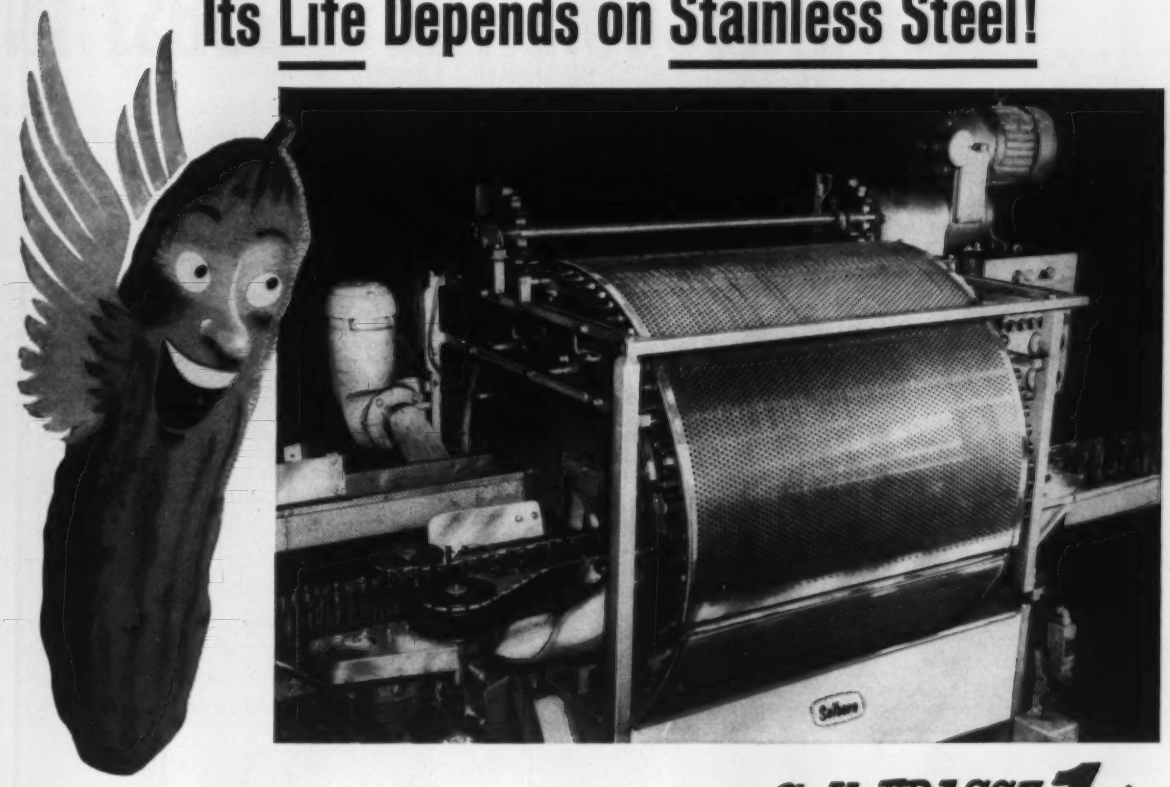
Meet the "Pickle Packer"—

Its Life Depends on Stainless Steel!



Pickles fly when this ingenious "Pickle Packer" goes into action. With unbelievable precision it packs 6,000 a *minute*—fills 18,000 jars an hour ...even guarantees full measure in the bargain. Seven times faster than previous methods...it's far less costly!

Despite corrosive brine, trouble-free operation and long life pose no problem...the "Pickle Packer" is completely made of corrosion resistant stainless steel. Stainless steel protects product purity—is easily cleaned ...meets sanitary codes.

Stainless steel bars, angles, sheets, plates, tubing and pipe are used in the "packer"...yet *every* item is shipped *from stock* by Frasse. Frasse carries every rolled form—in a wide range of sizes and analyses...has a wealth of know-how in applying stainless to *build sales*.

Think your product can use more *life*—and the built-in sales appeal of stainless steel? You'll profit by a call to Frasse.

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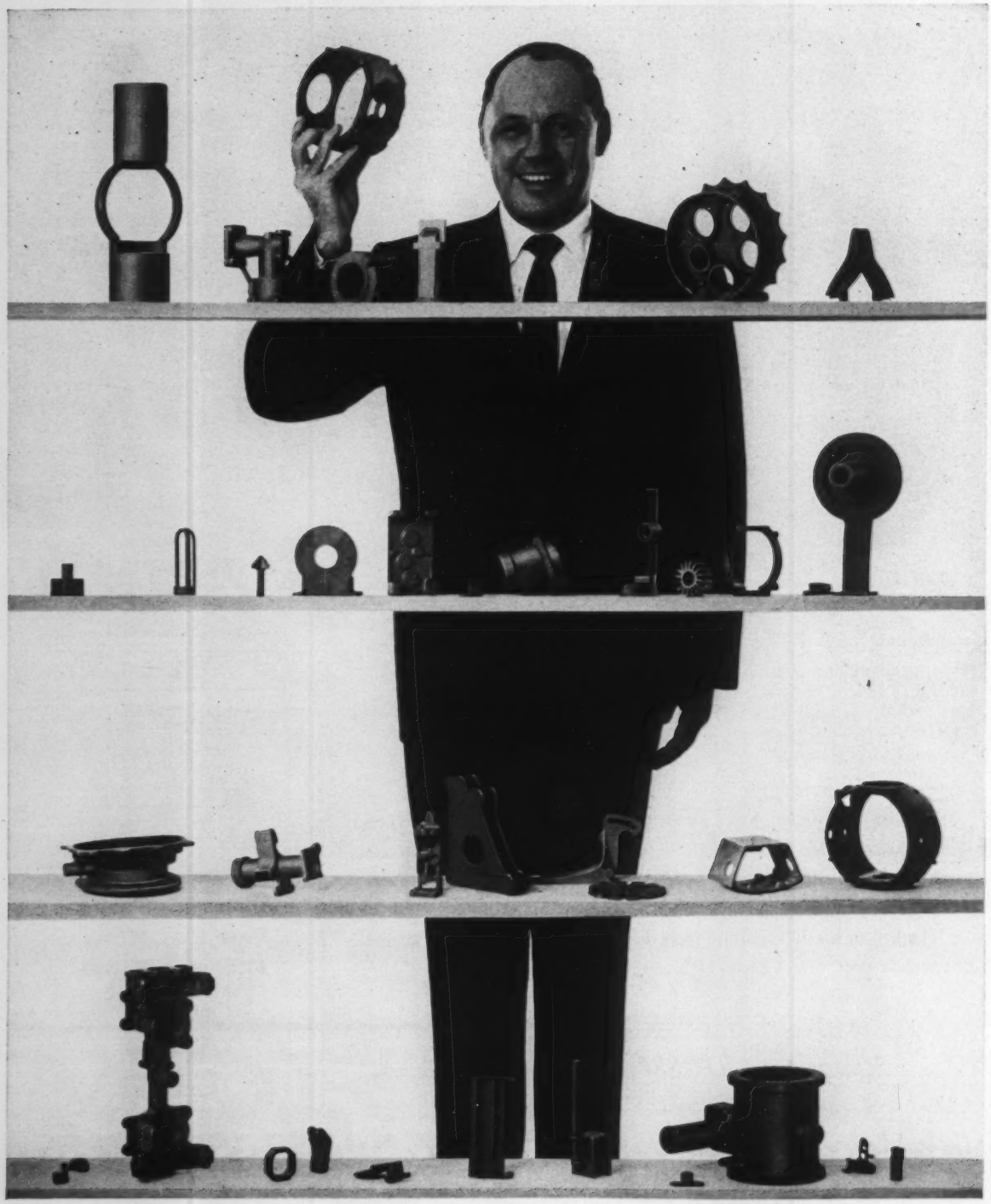

welcomed "little" jobs, too–

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...and it makes good sense both for Arwood and its customers

No investment casting job has ever been or ever will be too small for us.

We don't have any "sidelines" nor is investment casting only a sideline with us. It is the "be-all and end-all" of our economic existence.

AS A RESULT: anybody–and we mean precisely that–*anybody* who suspects, thinks, feels or believes that an investment casting will help him solve a design or production problem gets the unqualified, undivided attention of the top talent we have to offer–from the trained field engineer in his territory, our design engineers, our estimating staff, our tooling men, and our production specialists. No one of these groups cares whether your order is for 50 parts or 100,000. If they accept the order, they want it handled to or above "specs"–preferably above.

Why? Simply because these men are dedicated to producing the finest that the investment casting process can deliver in any design, in any castable alloy (we cast any that can be), and in prototype quantities so small that it might surprise you.

This attitude of theirs is far from philanthropic. From an accountant's eye view, they realize full well that your "little ones" may soon grow up and become big ones.

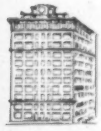
And when they do, Arwood is ready . . . more so than any other investment caster. In fact, we can take in stride all the volume that's required. Our five plants, extending from coast to coast, each with its own research, tooling, quality control and production facilities, can handle the biggest job you can offer.

In short, once the prototype or experimental phase is completed, Arwood can give you the quantity production you need, *and* deliver it when you need it.

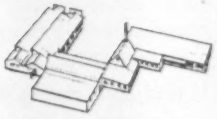
What more can we say? We can only sum it up by saying this – If you have a "difficult" part remember this: most "difficult" components, no matter what the alloy or quantity, might well be produced as an Arwood investment casting . . . and the cost is often extremely low, compared with conventional methods.

On the other hand, if we can't do it–and do it economically – we'll be the first to tell you so – immediately. We'd rather lose an order than a customer. As you can count on Arwood, you can count on that. Try us and see.

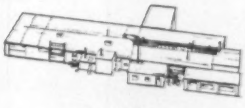
ARE YOU *REALLY* UP-TO-DATE ON WHAT INVESTMENT CASTING CAN DO? A lot of over-optimistic information has been disseminated in the past. Our 48-page "Practical Guide" gives forthright answers on what to expect, and, equally important, what *not* to expect. It tells how to save money by designing for the process, and also gives complete tables on the properties of castable alloys. It's yours for the asking.



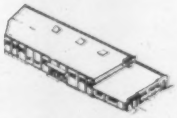
BROOKLYN



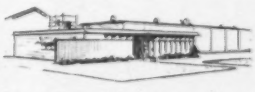
TILTON



GROTON



LOS ANGELES



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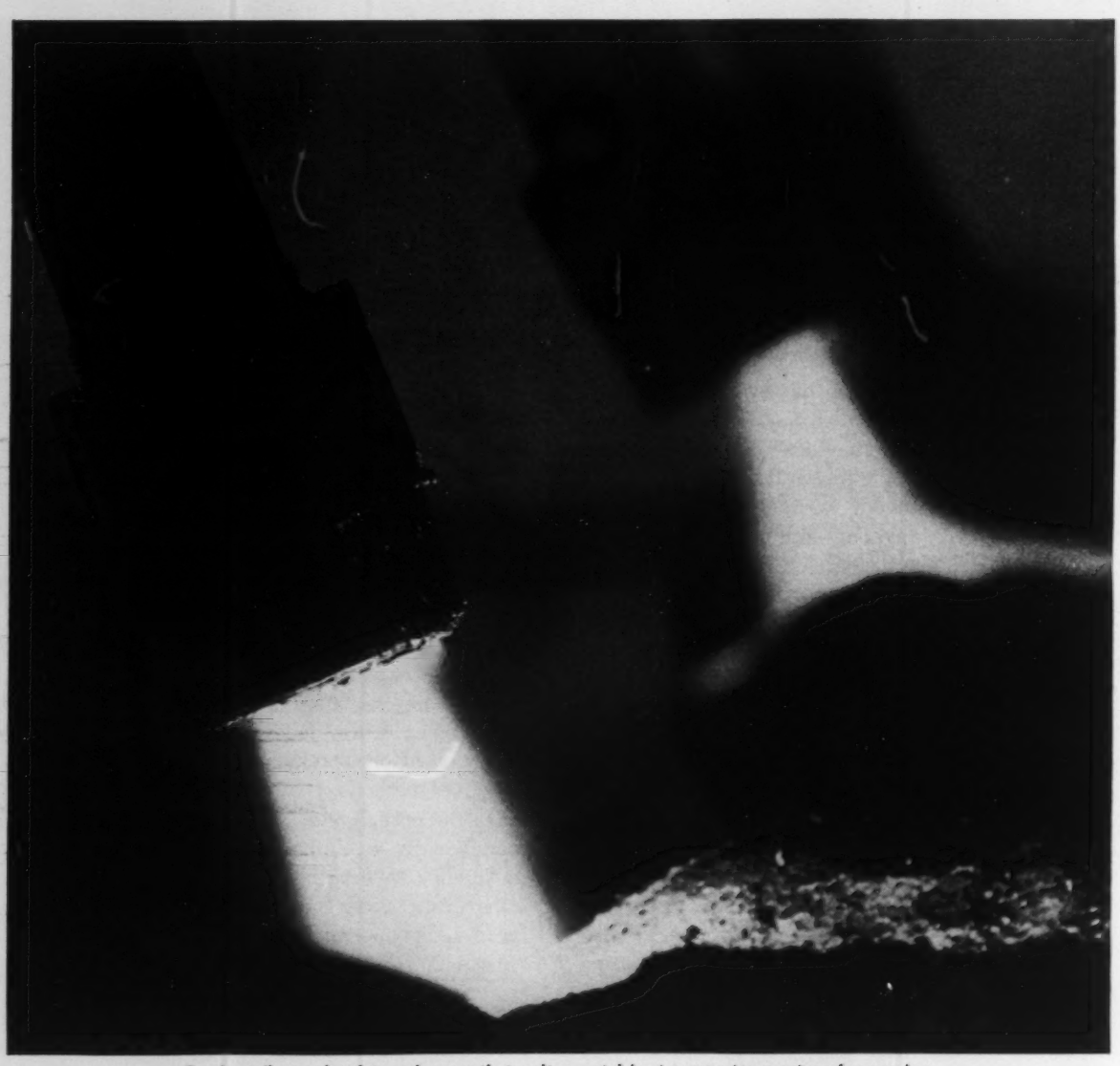

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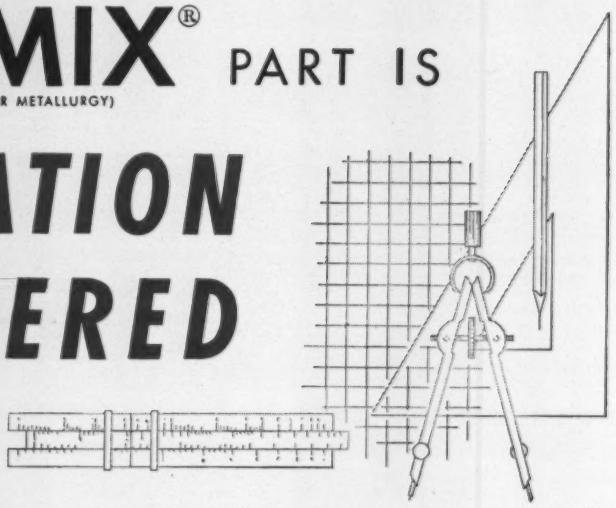
EVERY GRAMIX® PART IS

(PRODUCTS OF POWDER METALLURGY)

APPLICATION ENGINEERED

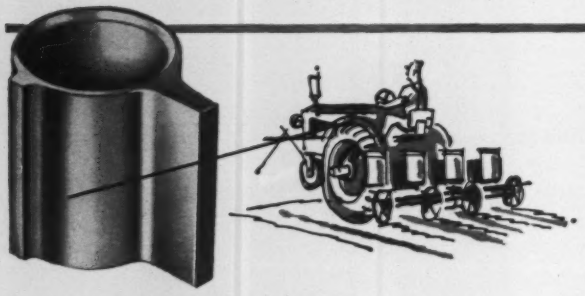


One of the most important factors to consider when purchasing powder metal parts is that of successful part performance; for a part to successfully perform its job, all of its physical and metallurgical characteristics must be suited to the application.

GRAMIX Products of Powder Metallurgy are always *Application Engineered,* which means product is specially matched to each specific application. From an almost unlimited variety of metal mixtures, one alloy is blended that contains the required properties and characteristics of the finished part; *all* aspects of part design and conditions under which it must operate are taken into account. Only then is the GRAMIX part produced.

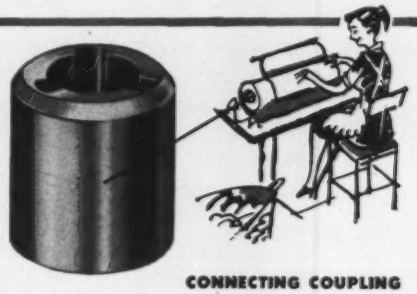
Eight of these *Application Engineered* GRAMIX parts are shown here. Each precisely suits the requirements of its job . . . each is the best part available for the job.

When you specify a GRAMIX part, you can always be sure that it has been *Application Engineered* for successful performance, long life and complete reliability. For more information on *Application Engineered* GRAMIX parts, write for Engineering Handbook G-55.



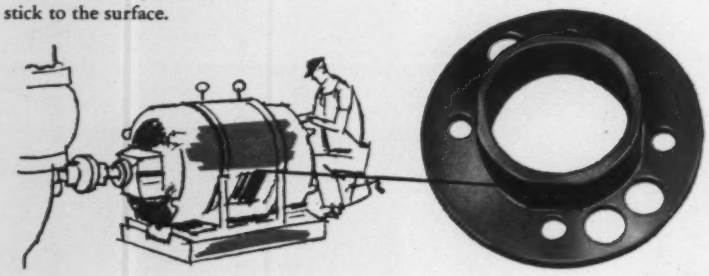
CORN SEEDER

GRAMIX was the material specified for this corn seeder part because the surface finish obtainable with the alloy used reduced the tendency of material to stick to the surface.



CONNECTING COUPLING

The connecting coupling employed in a small home ironer is formed from a special GRAMIX hardened steel alloy; it offers low wear and shock resistance.



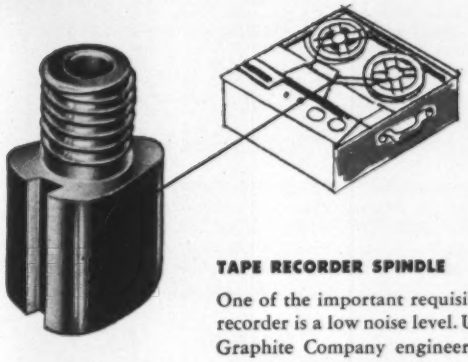
CONTAINER COVER END CAP

Great savings were realized when retainer caps for certain types of electric motors were made of GRAMIX.

This process made it simple and economical to mold the multiple holes to precise tolerances without extra operations.

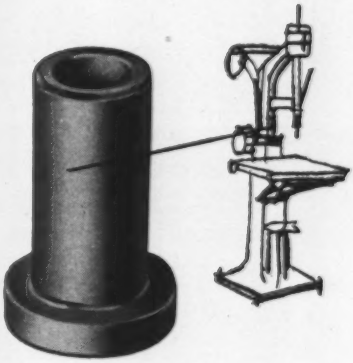
HELICOPTER THRUST WASHER

The outstanding features of the GRAMIX alloy specified for this thrust washer are a dependable and consistent friction and wear pattern as well as a fine surface finish.



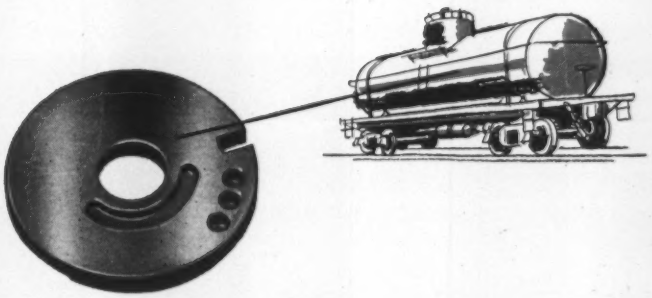
TAPE RECORDER SPINDLE

One of the important requisites in a tape recorder is a low noise level. United States Graphite Company engineers developed a special alloy to meet these requirements in the GRAMIX spindle.



GUIDE BEARING

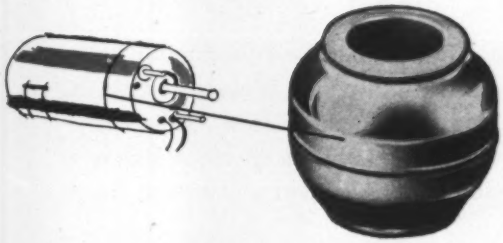
Built-in lubrication and low friction to reduce heat are important features of the GRAMIX alloy chosen for this guide bearing.



LIQUID PUMP END PLATE

This end plate is typical of many parts employed in liquid pumps of many types.

It is made from a wear resistant bronze alloy that was developed for pump applications.



FRACTIONAL H.P. MOTOR

The GRAMIX bearing for this Fractional h.p. motor was developed from a special low noise level alloy.

Its self-lubricating properties were also an important consideration in specifying GRAMIX.

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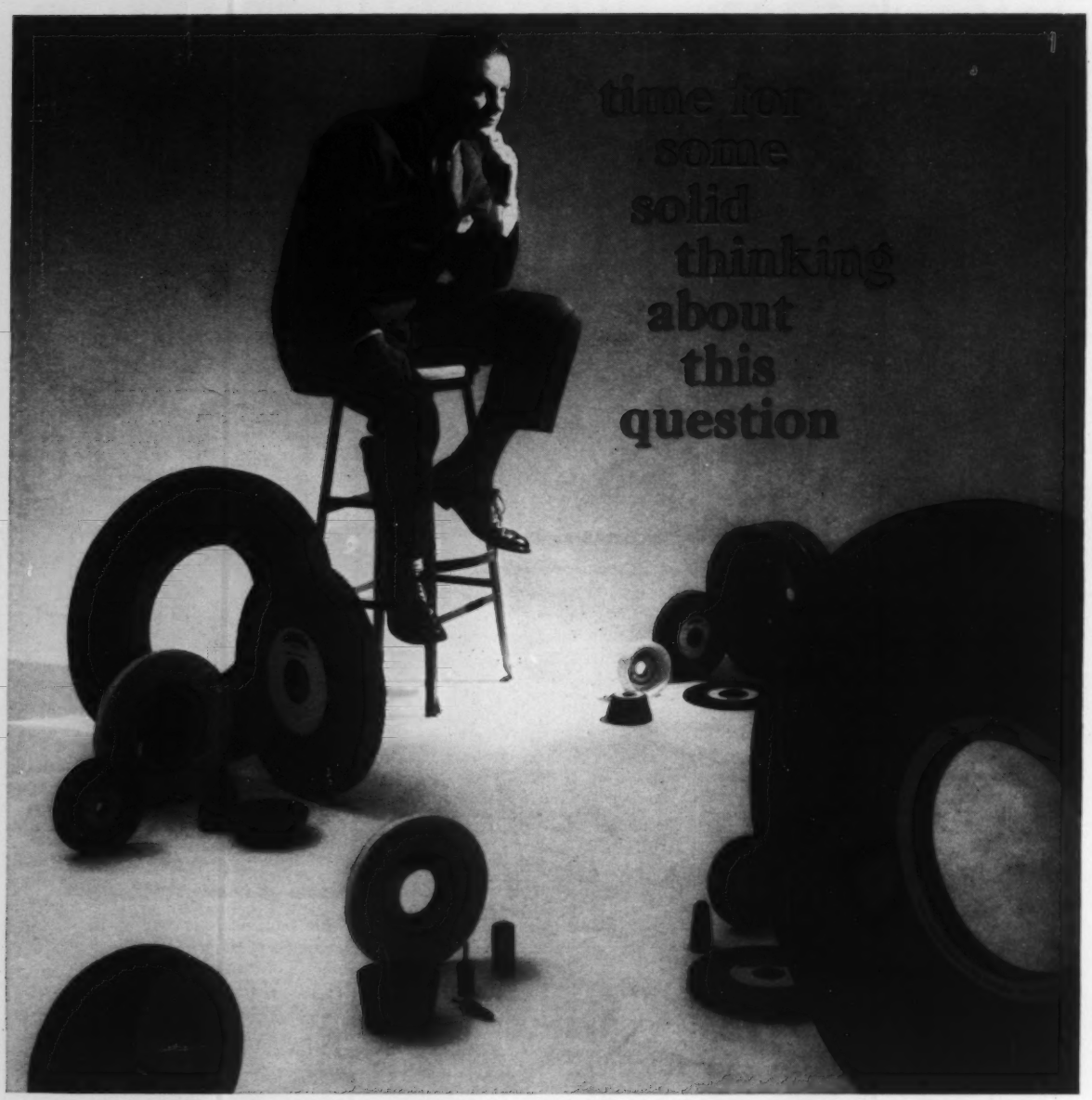

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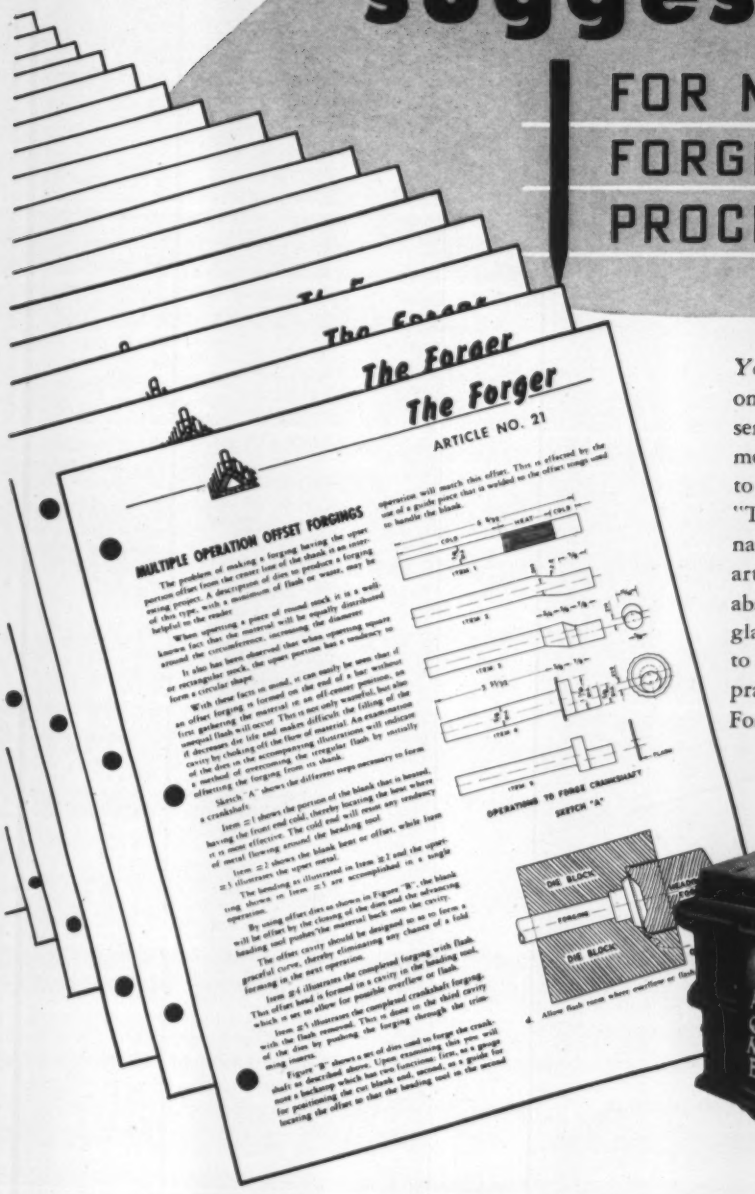

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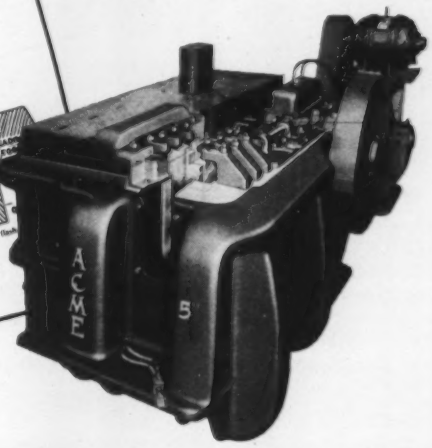

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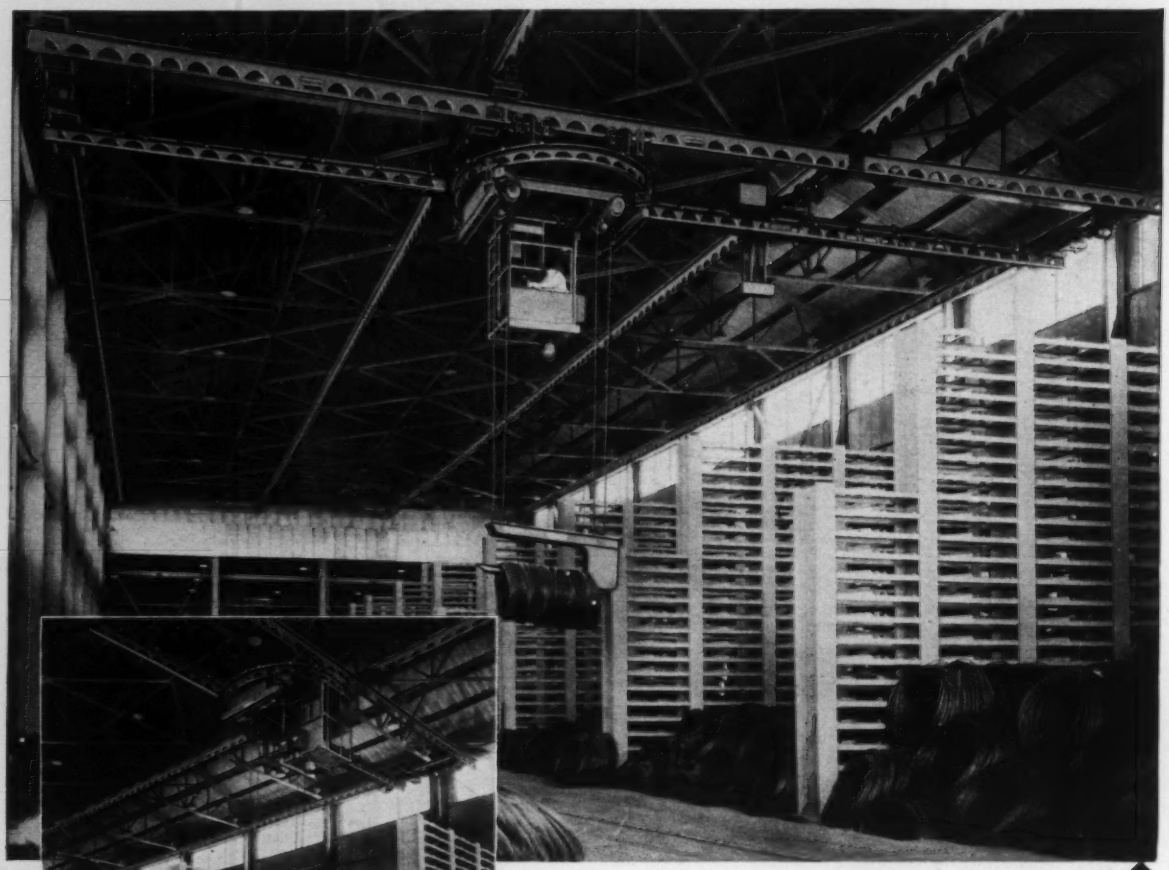
Provides Ultimate In Wire and Rod Handling Efficiency



The hairpin hook can be tilted up or down to permit easy threading into or removal from the coils. The hook handles 3,500 lbs. of rod and can be turned to any direction as illustrated in the two photographs.

The operator in the Cleveland Tramrail crane cab handles coils in and out of storage unassisted by workers on the floor. He is always over his work and has a clear view because the cab is attached to the crane carrier.

Five motions: hoisting, tilting, trolley travel, bridge travel and rotation are provided in a Cleveland Tramrail crane for handling coiled rod. The trolley travels on a 76-foot double-girder crane bridge from side to side of a building. A rotating carrier operates on a circular track built into the trolley. It turns unlimitedly in either direction. The crane travels on four runway tracks and is controlled from a cab which is attached to the carrier.

Coiled rod is picked up from incoming railroad cars by a hairpin-type hook and turned 90 degrees for placement into large bins along one side of the storage building. The hook can be tilted either up or down for threading into or drawing away from the coils.

The unit handles 3,500 lbs. of rod in addition to the weight of the hairpin hook. Bridge and trolley control are variable five-speed magnetic with dynamic braking. Hoist control is variable-speed drum type with dynamic lowering. Rotating control is automatic accelerating.

With a wealth of experience to draw on, Cleveland Tramrail engineers are in position to help you with a wide range of materials handling problems. We welcome an opportunity to work with you.

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Thompson can make the steel that guarantees you product satisfaction. We have the very latest in strip mill equipment; workmen who have spent their lifetimes accumulating steel "know-how;" standards of quality that have never been compromised.

There is a difference in Thompson Service. Phone today. You'll be connected to a man who not only will get your order started properly and without delay, but who like all of us at Thompson's has a sincere desire to be helpful. Your order will be shipped direct from our mill, saving you time and money.

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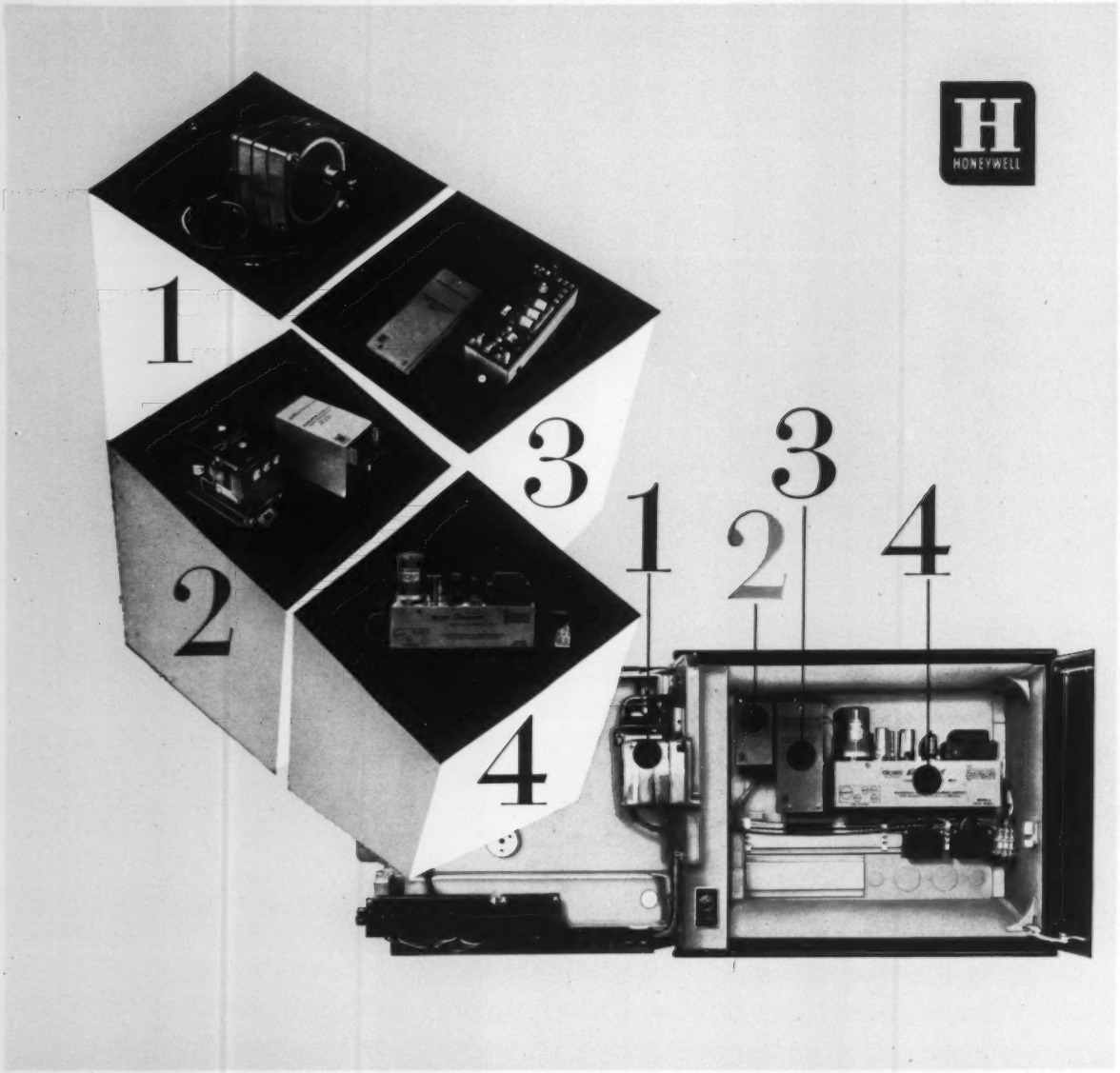
NAtional 5-7474	PRescott 5-6804	CYpress 8-6550	PLeasant 6-4643	ATwater 4-8500



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How DSC DEEP ROLLED RBF STEEL STRIP Can Give Your Products a Durable, Expensive-Looking Showroom Finish— *Inexpensively*

AUTOMOTIVE NEWS recently reported on a new durable double-nickel chromium plating process that was "sweeping industry" and giving plating "its biggest technical gain in 31 years."

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WHY DEEP ROLLED?—Because this *Accutronic*® Strip is produced on bright planished rolls *all the way*—from the first cold reduction pass to the last. "Satin" never touches this strip. That's why it won't break out in a "pepper-and-salt" rash even in severe bending, forming or drawing.

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Glint in the Eye

WOLFSBURG, GERMANY

American visitors to this home of the Volkswagen are impressed by many things. They envy the booming prosperity of West Germany. They wonder at the speed with which cities, reduced to knee-high rubble during the war, have been reconstructed. They marvel at the way the "folks-cars" spin off the assembly lines like bottle caps.

But most impressive of all is the attitude of the German worker—on the assembly line, at the drawing board or typewriter, or in the manager's office. He works with a sober and enthusiastic devotion. There is no goofing off.

The hourly paid worker performs as if he owned the plant. The white-collar worker lingers not at the water cooler or coffee canteen. The manager resents interruptions to talk about yesterday's soccer game, but he'll take time out to listen to new trade opportunities.

The German worker—at all levels—has a glint in his eye.

We tried to figure out why.

Is it because most Germans do not yet have the creature comforts that Americans take for granted? Is it because they do not have refrigerators, popup toasters, vacuum cleaners, and outboard motors to the degree we have? And are they willing to work more efficiently to obtain them?

Certainly, creature comforts provide at least part of the incentive. But there are more intangible reasons.

There is a drive for status—personal and national. From a defeated and miserable beginning 15 years ago, the Germans have come a long way. They are proud of their progress and they want a great deal more.

"We have the need for a future," a 30-year-old assembly line worker told us. "And we know we must work for it."

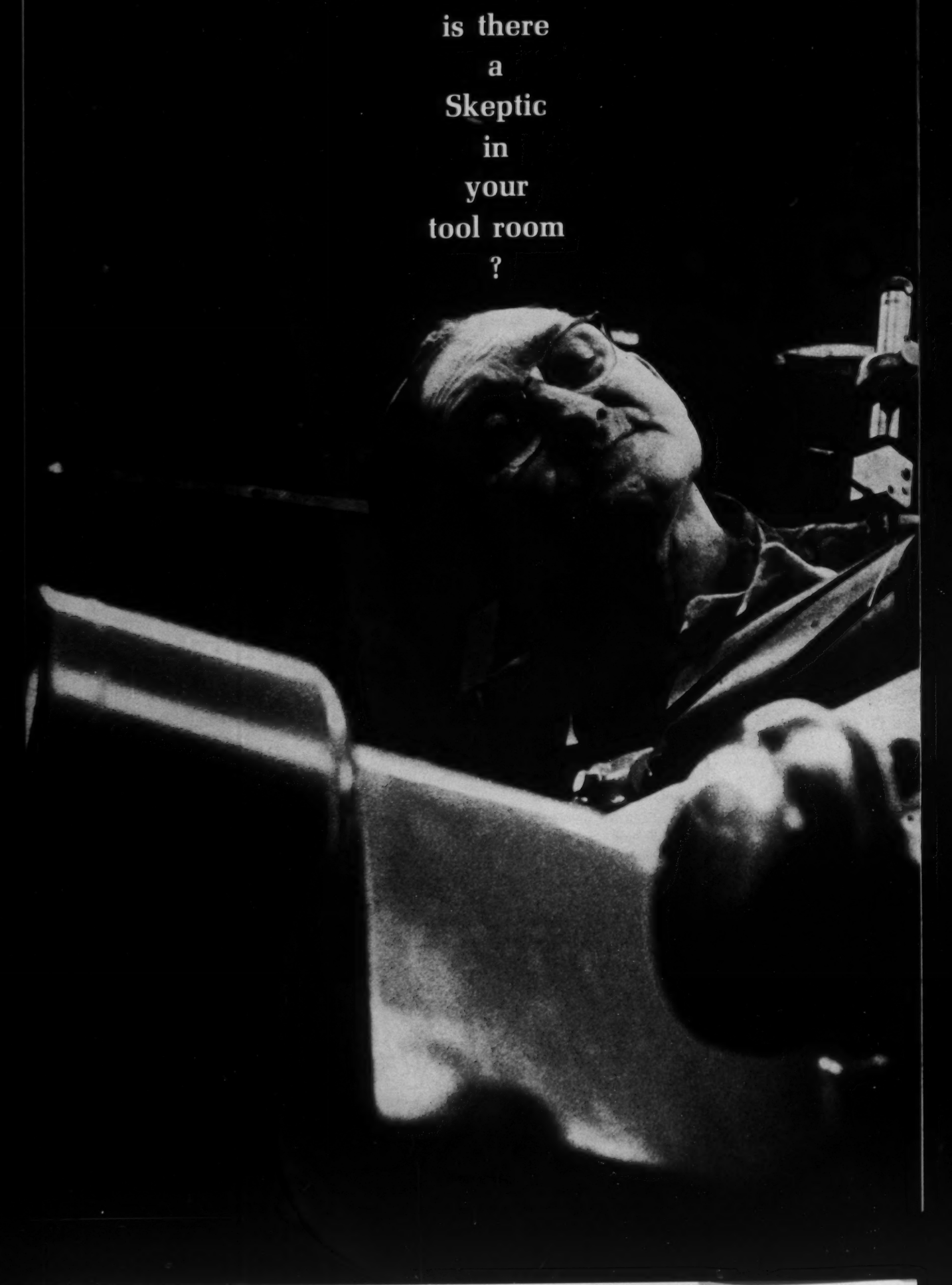
We have to admire the attitude of the German worker and industrialist. We have to admire the glint in their eyes.

We wish we had more of it over here.

Walter J Campbell

EDITOR

is there
a
Skeptic
in
your
tool room
?



There is a totally new grinding wheel so genuinely good that you'll want no one but your tool room skeptic—the man *least* likely to be impressed—to make the test.

Set up on one of the super-hard tool steels, or on a rugged circular-form grinding job. Together you will experience the rare pleasure of discovering something entirely new and honestly superior: a wheel with the staying power to grind farther and faster than any other you have known.

The wheel to specify is Carborundum's PA-V40 (the initials PA stand for a totally new abrasive grain). To arrange an immediate test, simply call your Carborundum distributor or factory representative.

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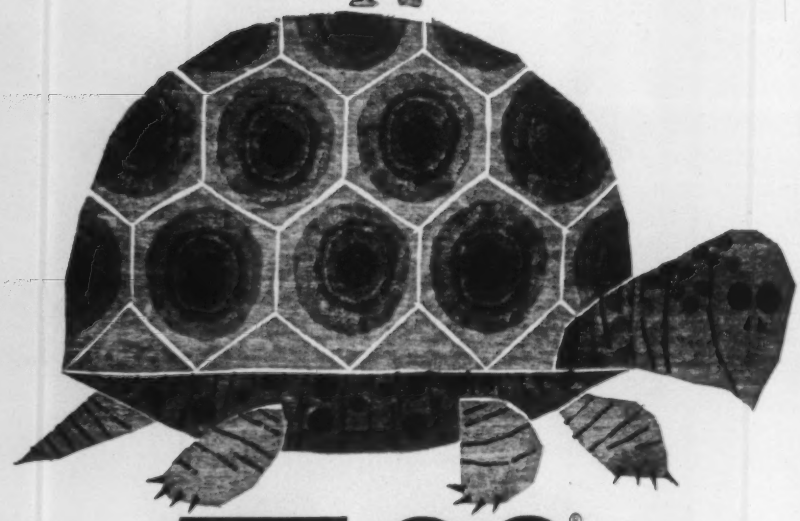

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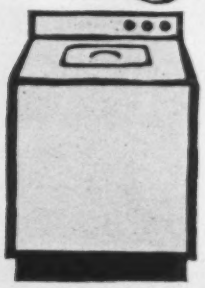

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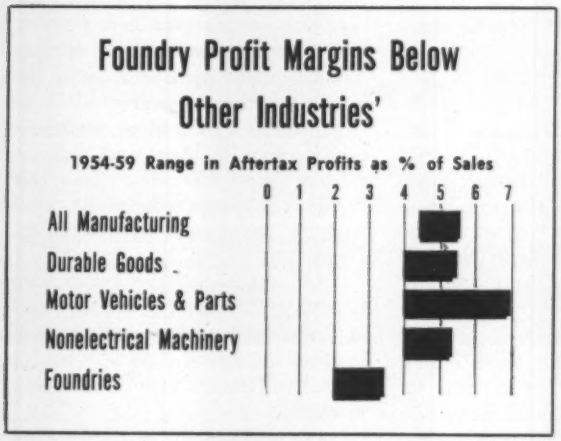
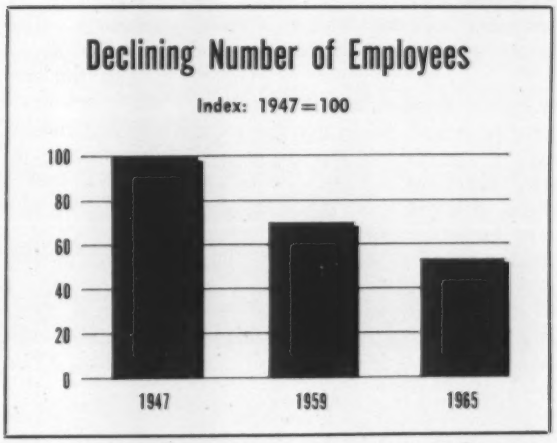
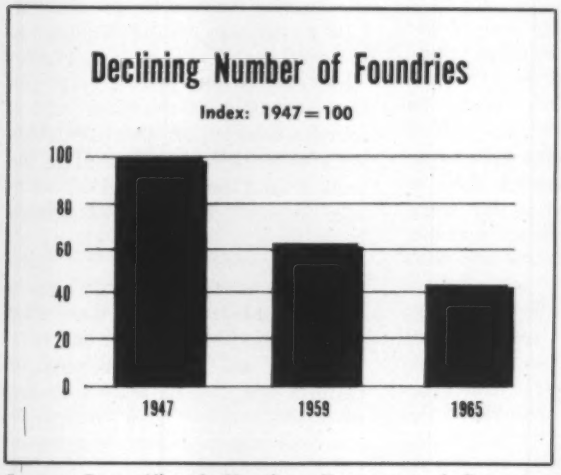

Foundry Profit Margins Below Other Industries'
1954-59 Range in Aftertax Profits as % of Sales
0 1 2 3 4 5 6 7
All Manufacturing
Durable Goods
Motor Vehicles & Parts
Nonelectrical Machinery
Foundries

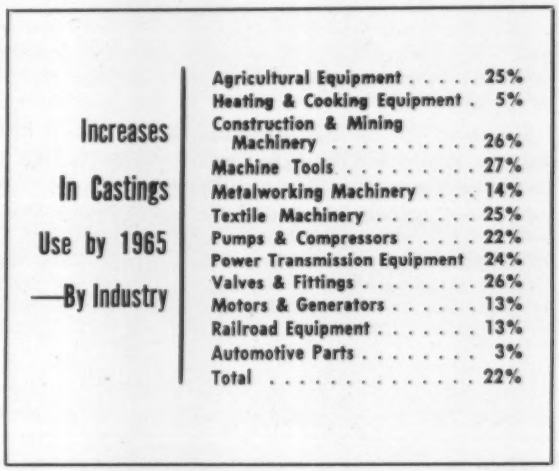
Sources: Securities & Exchange Commission, Federal Trade Commission, Robert Morris Associates.



Sources: Booz, Allen & Hamilton, Department of Commerce.



Sources: Booz, Allen & Hamilton, Department of Commerce.


Increases In Castings Use by 1965 —By Industry
Agricultural Equipment 25%
Heating & Cooking Equipment . 5%
Construction & Mining Machinery 26%
Machine Tools 27%
Metalworking Machinery 14%
Textile Machinery 25%
Pumps & Compressors 22%
Power Transmission Equipment 24%
Valves & Fittings 26%
Motors & Generators 13%
Railroad Equipment 13%
Automotive Parts 3%
Total 22%

Source: *Foundry* survey.

Help Coming for Casting Buyers

THE FERROUS FOUNDRY industry is attempting to cure its perennial economic ills in a manner that promises significant benefits to users of castings.

The industry has diagnosed its illness and found that it stems principally from lack of aggressiveness and from outdated management methods. The progressive foundries, with the aid of their industry associations, are taking the initial steps in what promises to become a significant rejuvenation.

Among the growing trends that will benefit users of castings: 1. Vastly improved design and engineering services. 2. Process innovations that are leading to better castings. 3. Recruitment and training programs that are paying off in higher caliber foundry personnel. 4. Market research efforts that are giving the foundries information about their markets which will permit them to better serve their customers. 5. A significant uptrend in productivity, thanks to fairly heavy investments, that can bring about lower costs to castings buyers.

Patient's Pulse Weak

Foundry output has held virtually constant for a decade while the industry's customers have boosted their output more than 40 per cent. Markets have been lost to competing materials. Harry Figgie Jr., president, Booz Allen Methods Service Inc., an affiliate of Booz, Allen & Hamilton, management consultants, estimates that the industry has lost about 30 per cent of its potential market since 1947.

In the last decade, the number

of gray iron foundries has declined by 30 per cent, the number of malleable foundries by about 20 per cent, and the number of steel foundries by more than 10 per cent.

• **Excess Capacity**—Although the foundry mortality rate has been severe, the industry continues to suffer from excess capacity. "At all times, there is from 20 to 45 per cent excess capacity in the industry," estimates Mr. Figgie. The steel foundry industry operated at 59 per cent of capacity last year and the gray iron foundry industry at 58 per cent.

• **Stable Output** — Shipments of gray iron castings totaled 11.6 million tons last year, 6 per cent below the 1959 figure. In the 1956-60 period, the industry's annual output has averaged 12.1 million tons. That compares with an average 13.6 million tons in the 1951-55 period.

Malleable iron castings shipments last year totaled 820,701 tons, down 10 per cent from the 1959 level. In the 1956-60 period, shipments have averaged 842,500 tons annually vs. 981,700 tons in the 1951-55 period.

Steel castings shipments last year totaled about 1.4 million tons, down less than 2 per cent from 1959. Shipments have averaged about 1.5 million tons annually in the 1956-60 period vs. about 1.7 million in the 1951-55 period.

The industry's plight, while serious, is not as severe as those bare figures would indicate. In the first place, a ton of castings will do more today than it would eight or ten years ago. Also, some of the industry's largest markets (machine tools and railroads, for example), were riding the crests of better sales trends early in the fifties than they have been recently.

So while ferrous foundries have lost ground to aluminum, plastics, and other materials, their market position is somewhat better than would be apparent at first glance.

More importantly, the foundry industry has begun a concerted campaign to widen its share of existing markets and open new markets. Foundries have, for example, done an outstanding job of getting castings designed into the compact cars. The average 1961 auto contains 100 lb of malleable castings, up from 97 lb in the average 1960 model. The Oldsmobile F-85 contains 152 lb (164.5 lb with power steering). The Buick Special contains 132 lb.

The nuclear energy field is another new market in which foundries are making their mark. Steel castings ranging from 50 to 19,000 lb are used in the hermetically sealed motor pumps in the pressurized water reactor systems of nuclear ships and powerplants. Several tons of steel castings were used in the *N. S. Savannah*.

• **Price Fighting**—But there aren't enough markets to go around in the still overcrowded foundry industry. The result has been severe price competition. It's caused by excess capacity, lack of growth, the existence of numerous marginal foundries, and the smallness of the average foundry. Another cause has been the captive shop. While the captives have little impact on the total tonnage of the jobbing industry, they do offer price competition that forces the job shops to cut their prices. Part of that stems from the fact that many managements really don't know the costs of maintaining their own captive foundry operations. Says Mr. Figgie: "It is without question that many captive foundries lose money, probably much more than company managements are able to determine because of ineffective accounting and overhead assignment practices." He urges foundries to convert a portion of the captive work to commercial business. He says "an over-all, concerted effort to contact, educate, and train executive and financial managements might result in a substantial number of them being liquidated."

• **Profit Problems**—Foundries have not passed along to the customer all of their increased costs. That, coupled with today's severe price competition, has played havoc with foundry profits. Mr. Figgie says that, in a bad year such as 1958, 86 per cent of the nation's foundries will lose money or break even. He says that more than 3 in 5 foundries have been in a loss position since 1957. For the last five years, the average foundry's after-tax profit has been only about 2 per cent of sales.

• **Smallness Hurts** — The foundry industry has been "strangling from smallness," asserts Mr. Figgie. He says the average gray iron foundry has 96 employees. The median foundry, more representative of the industry than the average, has 35 employees. The median malleable foundry has 180 employees and the median steel foundry has 150. "Only the largest foundries consistently make money," says Mr. Figgie.

Most small foundries suffer from nepotism, from lack of management aggressiveness, from inability to support important staff services, or from indifference toward their own growth.

New Emphasis on Marketing

"Probably the single most needed business concept in the foundry is a recognition of the importance of marketing," says Mr. Figgie. That area is now getting emphasis from executives of the three ferrous foundry associations and from their more progressive members. The results should be beneficial to castings buyers. Examples of what's being done:

• Steel Founders' Society has published 14 market research reports for its members. Ten of them give needed facts about specific markets, including ten year projections of castings usage. The other four are investigations of lead indicators that will help foundries do a better job of sales forecasting.

• Gray Iron Founders' Society has held three-day sales clinics for members to improve their sales techniques and marketing emphasis. GIFS has also sponsored twenty-nine 1-day clinics for customers' engineers and purchasing agents to acquaint them with new developments in gray iron castings. The program has been effective. Of the 901 persons who attended, 44 per cent have completed an evaluation questionnaire. Half of them reported they had found new applications for gray iron as a direct result of the clinics.

• Malleable Founders Society has held twelve 2-day market development conferences for members' sales people. Object: Improve their knowledge of marketing.

• **Technology Improving** — Like many other basic material indus-

tries, the foundries have been relatively slow to embrace modern technology. But the more aggressive foundries are adopting productive equipment and processes that upgrade product quality, seek applications for castings where hitherto the requirements couldn't be met. Result: A rebirth of interest in castings among design engineers with problem jobs.

Water cooled cupolas, preheated air, automatic material handling, slag control, shell molding, and other process improvements have been widely accepted. The use of shell cores has increased rapidly. Several foundries have completed operations for automatic mulling and distribution of sand. Tolerances have been tightened. Radiographic and magnetic particle testing have been widely adopted.

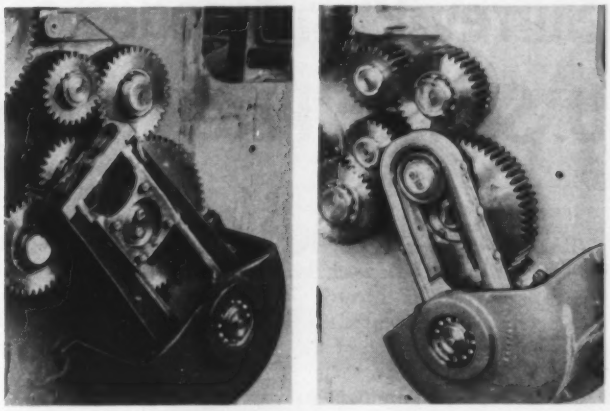
A new soft-nitriding process for hardening finished parts, developed in Germany, has been investigated by the Malleable Founders Society. Hans Heine, technical director, says the studies indicate that wear resistance can "be increased by a factor of ten and fatigue strength can be increased upward of 30 per cent." It could give ferritic malleable iron a chance at some new markets.

Growth of ductile iron is delighting gray iron foundries. It has been proved as a Space Age material in such jobs as the launching rails for the Army's Lacrosse missile, and the support for the warhead canister in a missile nose cone. It's being specified for a variety of jobs where high strength is needed yet some vibration quelling properties are desirable.

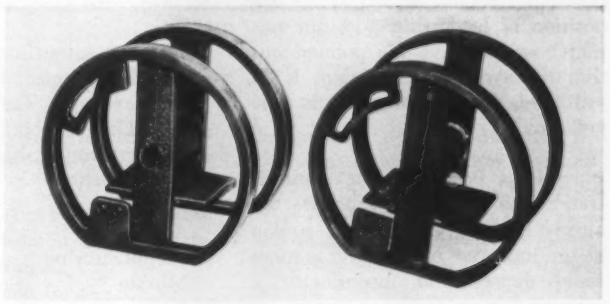
Pearlitic malleable iron now accounts for about 25 per cent of the malleable foundry industry's volume, has been upgraded for tough jobs. For example, ASTM specification A 220-55T for Grade 80002 calls for 100,000 psi tensile strength, 80,000 psi yield strength, and 2 per cent elongation in 2 inches. Experimental work has yielded tensile strengths in excess of 120,000 psi and yield strengths above 100,000 psi.

Steel foundries are making much wider use of heat treating to strengthen castings. More than 15 per cent of the castings produced last year had a tensile strength in excess of 90,000 psi.

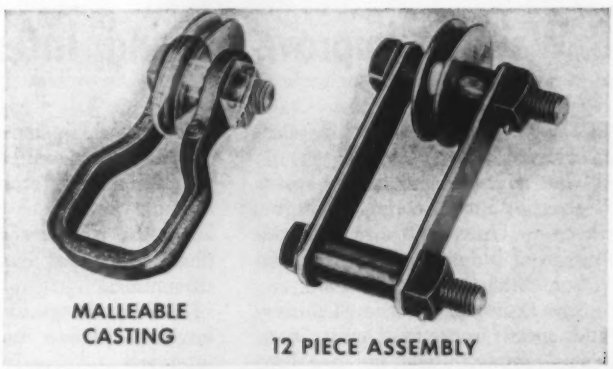
Foundries are making valiant efforts to recoup jobs that castings have lost to competitive products. And through improved promotion, design assistance, engineering aid, and customer clinics, they are winning new jobs for their product. Here are some examples . . .



S&S Corrugated Paper Machinery Co., Brooklyn, N. Y., had been fabricating its crank mechanism from nine pieces of steel (left). Jack Surks, machinery designer, hit upon casting the rocker arm (right). Result: Components reduced from nine to three, weight cut by 48 per cent, cost savings totaling 74 per cent



Paul Huffman, manager, Virginia Foundry Co., Roanoke, Va., helped a customer redesign this type cylinder for an automatic imprint press. A gray iron casting was substituted for a machined assembly. Cost was trimmed 87 per cent, as eight production operations were eliminated



Redesigning this clevis from an assembly to a malleable casting brought down the number of parts from 12 to 5, reduced the weight from 3¾ lb to 1½ lb, and trimmed the cost 45 per cent

Treasury Secretary Dillon charges . . .

'Surrey Plan Needed to Help U. S. Keep Pace with Russia'

TREASURY Secretary Douglas Dillon—first witness last week before the House Ways & Means Committee on the President's tax proposals—spelled out some of the administration's thinking.

Comparing our annual growth rate of 2 per cent during the 1950s to that of the Soviets (the Central Intelligence Agency's estimate is 7 per cent), he bluntly told Congress:

"We must improve our performance. Otherwise, we cannot maintain our national security . . . our position of leadership . . . our national aspirations." He pointed out that the average U. S. plant is 24 years old, and its equipment is nine years old.

• **Explains Position**—The administration, he pointed out, prefers the Surrey Plan (STEEL, May 1, p. 23) of tax incentive credits over a more rapid depreciation formula or a general tax cut for corporations as a means of stepping up industry's rate of modernization. He added: A tax cut would benefit all firms, not just those which modernized. More rapid depreciation would only postpone the "due date for investors' tax liability on the earnings of an asset." Here's an example:

"Consider a 20 year asset which yields about 11 per cent, using a double declining balance method of depreciation. The 15 per cent credit (Surrey Plan) would raise its rate of return to nearly 14 per cent." He also charged that increased depreciation is a cost—and a pressure to raise prices.

• **Impact**—An estimated 8000 firms would be affected by the Surrey Plan, says the Treasury Department. Here's a breakdown of how industries would share in the $1.7 billion worth of tax credits:

Agriculture	14%
Manufacturing	42%
Mining	3%
Railroads	1%
Other Transportation	5%
Professional Firms	4%
Other	31%

Secretary Dillon predicted: This year, 94 per cent of all business firms would be eligible for the 6 per cent credit under the Surrey Plan—those firms spending at least half as much, but not more, than they take in depreciation allowances. The remaining 6 per cent account for the greater part of our national production, and more than 60 per cent of them would be eligible for the 15 per cent credit.

He tied the Surrey Plan to the recommendation that capital gain treatment be withdrawn from profits on the sale of depreciable property. Treated as ordinary income, this would mean an additional $200 million in revenue to help offset the $1.7 billion cost of the Surrey Plan.

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8 Ways to Improve 'Buying' Interviews

IT'S poor business to keep a salesman waiting.

That advice to purchasing agents is given by Prof. George S. Odiorne, director, University of Michigan Bureau of Industrial Relations, Ann Arbor, Mich.

Says Professor Odiorne: "Courtesy and speed in getting most interviews completed add up to a buying climate which gets the job done quickly, with a minimum of nonsense and red tape."

He lists these steps to better purchasing interviews:

1. Compile a record of the types of interviews you have. If you know the rules for each type, this phase of your business will be streamlined.

2. Keep things under control by having a pattern in mind for each interview.

3. Use nondirective methods to draw a man out. Don't ask direct questions. Drop key words and phrases or "mirror" the salesman's words to keep him talking freely.

4. Interview in private.

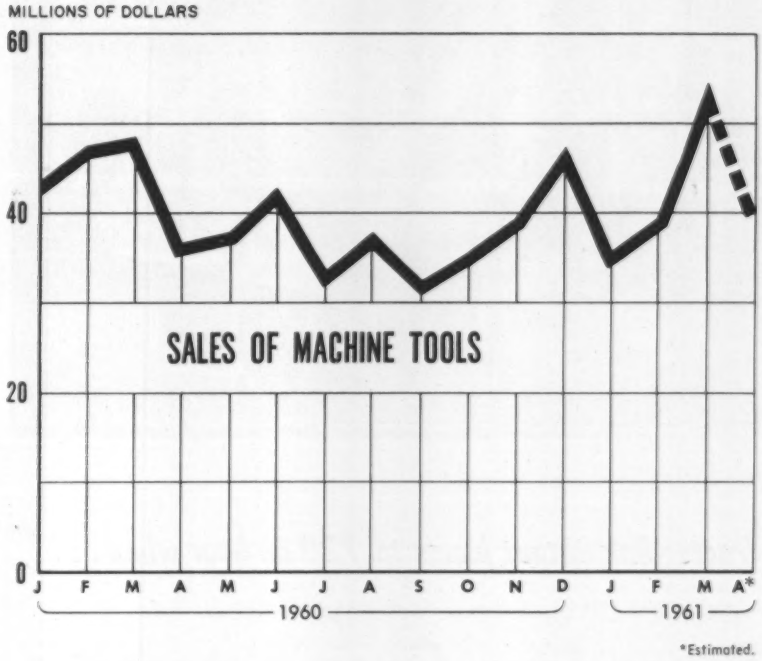
5. Develop your fact getting powers through questioning. While the salesman can't be considered an opponent, you should develop flaws or gaps in his story.

6. Let the man know how much time he has; drop hints as to progress along the way; and cut off smoothly when his time is up.

7. Make notes on crucial interviews—otherwise, you may forget or ignore concessions you've gained.

8. Maintain a businesslike but friendly manner.

Capital Spending Spree? Not Yet



• RELATIVELY heavy machine tool business in March gave rise to hopes that the long awaited upturn in capital spending had arrived.

April business dispelled the notion, machine tool builders tell STEEL. New orders for metal cutting machines hit $54.65 million in March. Now it looks like April new orders will skid back to the February level, $39.45 million.

• Buyer interest is high, but money isn't being committed.

A group of machine tool builders, queried by STEEL, sum up business this way:

• Customers want to buy, but they're doing more shopping than spending. Inquiries and requests for quotes are coming in at a brisk pace, but, as one builder puts it: "Our problem is to get the money on the line."

• March's boomlet looked healthy since much of it was for relatively standard machines, and the orders came from a wide variety of metalworking companies. Nearly all the increase was from domestic firms.

• Export business is still good, but builders are wary of what will happen when their foreign competitors can match them on delivery. U. S. builders can deliver a machine abroad 18 months or so earlier than foreign builders can.

• Some builders of special machines picked up orders from automakers in March (largely for an engine block line), but most don't expect a genuine increase in business until summer when the orders are placed for equipment to make '63 models.

• The consensus is the real upturn in capital spending awaits some customer prosperity, and the fourth quarter may be the time. But one big builder cautions that the upturn may well come before fall—perhaps by July 1.

• Builders of forming equipment say their business pattern is about like that for metal cutting. February was low: $6.95 million. March was better: $14.9 million. Business went down in April.

• Builders say the President's depreciation plans won't trigger the upturn.

"President Kennedy's depreciation program is a step in the right direction, and industry has needed this kind of action for a long time," one builder told STEEL. "But it isn't a magic wand we can wave to turn equipment needs into dollar spending. Only genuine customer confidence in the upturn will do that."

Commenting on the timing of the pickup, Swan E. Bergstrom, president, Cincinnati Milling Machine Co., Cincinnati, said recently: The upturn in machine tool orders may begin by the middle of the year. He counts the tax incentive measures before Congress as "encouraging signs."

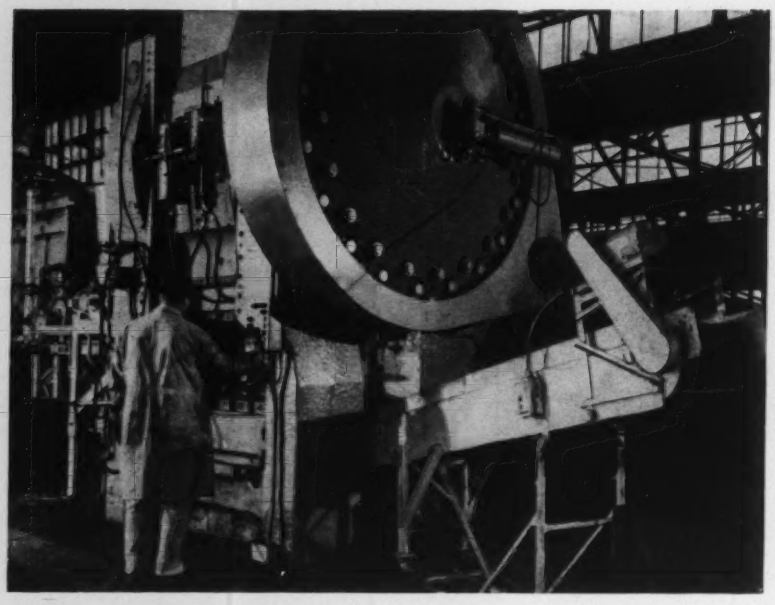
He also credits continuing success in selling both to Japan and Europe as an important factor in his company's current business. The same can be said about the rest of the industry: Foreign orders have kept the recession from turning into a real depression for the machine tool industry. Builders are now betting that domestic business will pick up steam in time to more than compensate for any possible drop in exports.

The timing is difficult to predict, but few expect they'll have to wait beyond December, 1961.

Domestic Firms May Get Guarantees for Investments In Underdeveloped Areas

COMMERCE SECRETARY Luther Hodges told the U. S. Chamber of Commerce last week that new guarantees are in the works for domestic firms willing to invest in underdeveloped countries.

State Department and Commerce Department committees are trying to develop a program of "monetary guarantee against expropriation and startup costs." The emphasis on underdeveloped countries ties in with the President's message asking that special tax treatment of U. S. subsidiaries in developed countries be killed.



Tractor link output jumps to 720 an hour when . . .

Forge Line Goes Automatic

AN AUTOMATIC press forging complex that promises to cut unit costs of forgings has gone into operation at AmForge Div., Chicago, American Brake Shoe Co.

The setup was installed to produce track links for crawler tractors and other commercial forgings at a rate at least twice as fast as any other forging technique in use, says Arthur G. Tichenor, division president.

It also requires half the manpower usually employed, handles the entire forging process (from billet heating to trimming and hot coining) without manual operation, and offers customers a press forging which will be cheaper, comparable in strength, and with as good or better dimensional tolerances and surface qualities as any commercially produced forging, says AmForge.

● **Development Costs** — The automated forging press and associated equipment has been almost two years in development and has cost nearly three quarters of a million dollars. Mr. Tichenor reveals that already about $1.5 million worth of business is booked for the automatic setup and that some orders that are now on forging hammers will be switched to the press.

According to industry estimates, says Mr. Tichenor, about 10 million track links are produced for original equipment manufacturers per year. There are about 200 forged links in the tracks of each crawler tractor. Because of the punishment they take, the track links are also a high volume replacement item.

Many other high volume items, such as conveyor belt links, automotive gears, and high pressure valves and fittings, will lend themselves to production on the new automatic press.

The forging setup consists of a gas-fired furnace, billet transfer equipment, and a 2500 ton forging press with automatic handling. Erie Foundry Co., Erie, Pa., built the press and the billet handling equipment through the press; Wilson Automation Co., Detroit, built the billet handling device between the furnace and press. The furnace was built by AmForge Division.

● **How It Works**—Special furnace controls permit a short heating cycle in which the billets are brought up to 2200° F. The hot billets are then automatically pushed out of the furnace at a rate which conforms to the operating speed of the new press.

As they leave the furnace, the billets are picked up on transfer equipment and carried to the press. Here, mechanical fingers take over and move the hot billets through a four-stage die. When a forging reaches the fourth die station on the press, it is trimmed and hot coined in one stroke. Then it's ejected onto a continuous conveyor line which carries it to a waiting tote box.

Initially, AmForge is running 720 links an hour. Normal manual forging production is about 300 links an hour. Plant men expect soon to push production up to 900 an hour and then 1200.

The short heating cycle and the speedy transfer of the hot billet from furnace to press expose the billet to the air for only a short period of time. This reduces scale formation and results in cleaner forgings. It also permits forging to closer tolerances, which, in many cases, should eliminate the need for additional finishing.

The elimination for tong hold space on the individual billets reduces the gross weight of the stock 3 to 4 per cent per billet.

Combined, these advantages spell out unit savings in conversion costs of up to 10 per cent, explains Mr. Tichenor.

AmForge has plans to extend the automation of the press still further. At present, the furnace is manually loaded, and forging flash must be separated from the part after it drops into the tote box. These operations could be made automatic.

Also, on larger track links, there will not be room on the press for a fourth, or trimming and coining station. Then, the forgings would be automatically fed into a separate trimming and coining press to perform that operation.

Sales Outlook Better, but Profits?

FIRST QUARTER profits of metalworkers were below year ago levels. The reasons: Consumer spending declined; manufacturers dug deeply into inventories; wage costs went up; price fighting.

Quarterly reports express the hope that business will improve steadily throughout the year—reversing last year's pattern. The optimism was generally confirmed by sales statistics for March and April. Certainly, they were better months than January and February.

For many firms, overseas sales—both through exports and foreign plant operations—contributed to better profits.

While higher sales are expected by most firms the remainder of this year, little improvement is expected in profit ratios. Cost cutting is still being pushed; some capital expenditures have been trimmed; and many firms are hoping better business will permit some needed price increases in the latter part of the year.

• **How Steelmakers Fared**—Steelmakers' operating results emphasize how rough the ride was in the first quarter. The industry's sales fell about 38 per cent short of those in the like 1960 period, and the low rate of production forced earnings down an estimated 77 per cent. While it is not likely that inventories will be built up substantially, steelmakers find comfort in the fact that purchasing is paralleling consumption more closely than it has in recent months.

Metalworking Profits Drop

(Net income)

	1961	1960
Allis-Chalmers Mfg. Co.	1,479,319	2,645,273
Aluminum Co. of America	8,253,906	12,635,046
American Brake Shoe Co.	914,960	1,039,260
American Can Co.	6,583,000	6,233,000
American Machine & Foundry Co.	7,527,000	6,832,000
American Radiator & Standard Sanitary Corp.	1,349,000	3,312,000
American Steel Foundries	853,997	2,019,012
Apex Smelting Co.	235,323	268,981
Blaw-Knox Co.	211,000	1,613,000
Bliss & Laughlin Inc.	199,124	806,533
Bohn Aluminum & Brass Corp.	(a)49,193	465,363
Borg-Warner Corp.	3,624,263	8,319,475
Bucyrus-Erie Co.	812,033	(a)232,853
Caterpillar Tractor Co.	11,562,294	8,860,786
Combustion Engineering Inc.	1,585,000	1,328,000
Cooper-Bessemer Corp.	320,477	1,078,126
Cutler-Hammer Inc.	1,067,914	1,537,373
De Vilbiss Co.	183,142	471,885
Electric Autolite Co.	777,576	2,371,773
Electric Storage Battery Co.	1,318,000	1,364,000
Federal-Mogul-Bower Bearings Inc.	2,457,000	2,467,000
Foster Wheeler Corp.	647,936	638,392
General Cable Corp.	1,402,601	2,377,747
General Electric Co.	42,476,000	52,614,000
General Motors Corp.	188,000,000	323,625,516
General Refractories Co.	822,195	1,726,018
General Telephone & Electronics Corp.	15,481,000	17,731,000
International Business Machines Corp.	48,826,669	35,178,509
International Minerals & Chemical Corp.	2,358,000	2,371,000
Joy Mfg. Co.	679,612	1,382,576
Kaiser Aluminum & Chemical Corp.	3,536,000	7,297,000
Koppers Co Inc.	924,000	1,773,000
Magma Copper Co.	1,725,729	(a)205,436
Martin Co.	4,914,690	3,488,122
Metal & Thermit Corp.	256,752	274,191
Minneapolis-Honeywell Regulator Co.	4,303,719	6,161,293
National Lead Co.	9,497,697	12,075,897
New York Air Brake Co.	204,690	392,923
North American Aviation Inc.	7,155,000	5,634,000
Olin	5,115,000	8,566,651
Outboard Marine Corp.	1,368,262	2,686,796
Parker-Hannifin Corp.	743,032	553,960
Phelps Dodge Corp.	9,128,000	4,826,000
Pittsburgh Forgings Co.	13,791	647,979
Porter (H. K.) Company Inc.	562,350	1,269,803
Raytheon Co.	1,365,000	2,160,000
Revere Copper & Brass Inc.	1,907,124	2,196,116
Reynolds Metals Co.	5,271,000	6,050,000
Rockwell Mfg. Co.	1,150,000	1,482,000
Rockwell-Standard Corp.	2,145,416	5,205,249
Signode Steel Strapping Co.	743,353	1,383,102
Simonds Saw & Steel Co.	507,883	1,242,544
Square D Co.	2,223,550	2,817,112
Studebaker-Packard Corp.	(a)6,492,666	2,801,639
Texas Instruments Inc.	3,773,000	3,930,000
Thompson Ramo Wooldridge Inc.	1,490,000	2,362,279
Triangle Conduit & Cable Co. Inc.	(a)372,874	353,082
Twin Coach Co.	250,000	268,000
Underwood Corp.	(a)2,879,000	(a)2,187,000
Union Carbide Corp.	33,724,000	42,091,000
Union Tank Car Co.	1,995,342	1,975,260
Westinghouse Electric Corp.	9,067,000	19,496,000
Whirlpool Corp.	2,689,291	3,934,432
Worthington Corp.	1,363,000	1,780,170

Steelmakers Earn 77% Less

(Net income)

	1961	1960
Acme Steel Co.	$27,365	$2,092,522
Alan Wood Steel Co.	(a)225,762	854,995
Allegheny Ludlum Steel Corp.	1,432,228	4,791,584
Armco Steel Corp.	9,260,000	23,957,994
Bethlehem Steel Corp.	7,971,692	51,828,727
Carpenter Steel Co.	946,328	1,839,428
Continental Steel Corp.	881,060	1,135,414
Copperweld Steel Corp.	(a)95,061	1,389,174
Crucible Steel Co. of America	(a)1,644,000	2,724,798
Detroit Steel Corp.	(a)118,168	3,539,607
Eastern Stainless Steel Corp.	473,903	779,335
Granite City Steel Co.	1,910,275	4,313,655
Inland Steel Co.	8,143,592	18,743,934
Jones & Laughlin Steel Corp.	2,587,000	17,794,000
Kaiser Steel Corp.	(a)1,063,441	6,686,660
Keystone Steel & Wire Co.	1,288,720	2,212,339
Lukens Steel Co.	541,365	2,314,442
McLouth Steel Corp.	2,175,975	5,826,974
National Steel Corp.	5,862,026	17,718,342
Pittsburgh Steel Co.	(a)1,246,956	2,167,577
Republic Steel Corp.	5,822,521	28,239,545
Sharon Steel Corp.	(a)550,763	2,057,249
U. S. Steel Corp.	31,976,670	112,578,752
Universal-Cyclops Steel Corp.	598,058	2,085,994
Vanadium-Alloys Steel Co.	277,679	627,733
Washington Steel Corp.	250,098	737,642
Wheeling Steel Corp.	(a)410,000	5,547,000
Youngstown Sheet & Tube Co.	2,679,425	12,891,248

(a) loss.

Price Champions Surrey Plan

HICKMAN PRICE JR.

1. Some companies haven't taken advantage of available depreciation practices.

2. Accelerated depreciation does not provide the direct results in spending the Surrey Plan could create.

3. The plan will result in a $1.7 billion loss in revenue, while accelerated depreciation could cost twice as much.

4. The plan will make a firm's earnings look better by allowing tax credits; better depreciation makes net profits smaller.

5. It provides a one-two punch by allowing tax credits immediately and increasing depreciation later as the new equipment is written off.

"THOSE ARE THE REASONS why metalworking should support the administration's proposed tax credit plan (STEEL, May 1, p. 23). It's a better deal for business than accelerated depreciation, yet it does not rule out the possibility of accelerated depreciation next year."

That's the opinion of Hickman Price Jr., assistant secretary of commerce, who is strongly behind the tax credit plan developed by Stanley Surrey, assistant secretary of treasury.

Mr. Price, who is also an advocate of President Kennedy's New Frontier, emphasizes another factor in the need for stimulating new equipment spending:

"Over the next five years, the U. S. needs to do a major job of modernization—parallel to that of the USSR."

He cites a statement by F. R. Kozlov, first vice chairman of the USSR council of ministers, as indicative of the world-wide challenge U. S. industry faces. Mr. Kozlov said earlier this year: "More than half the growth in labor productivity Russia has planned for the seven year period 1959-65 is to be effected through the introduction of new machinery and equipment. In practical terms, this means that all branches of the national economy will be re-equipped in the seven year period."

Mr. Price is convinced the Surrey Plan is needed to provide U. S. industry with an immediate stimulus to match the Soviet Union's re-equipment program. We're in "a war for industrial supremacy," he points out.

The new assistant secretary admits there are some "bugs" in the plan which the administration is trying to work out. But he views the President's tax message to Congress as "the most important in many years. It faces up to the whole question of achieving an increased growth rate."

● **KEFAUVER EYES IDENTICAL BIDS**—The Antitrust & Monopoly Subcommittee chaired by Sen. Estes Kefauver (D., Tenn.) is looking over Defense Department data on identical bids submitted by contractors. Subcommittee sources hint they are analyzing the data in an attempt to pin down which industries are most involved in identical bidding practices. Witnesses may be called to explain.

Industry spokesmen have warned that identical bidding can occur easily where off-the-shelf items are involved in procurement by defense. Such government agencies as the Tennessee Valley Authority support industry on this point. But the senator appears determined to keep his subcommittee in the identical bid field.

Senator Kefauver is being backed up by President Kennedy's latest executive order requiring all government agencies to report cases of identical bidding within 20 days after award of a contract. In the past, agencies reported cases of identical bidding when they thought there might be evidence of illegal practices: Up to 1000 cases a year have reportedly gone to the Justice Department, but little evidence of violations has turned up.

● **EXPORT CONTROL MODIFICATION?**—The White House is sitting on a report from the Commerce Department which recommends creation of a special board of review for licenses to ship to the USSR. Under the recommendation, Commerce still would handle the bulk of applications for licenses, but controversial licenses would go upstairs to the board and eventually to the President. Machine tool shipments would be under this special board in many cases.

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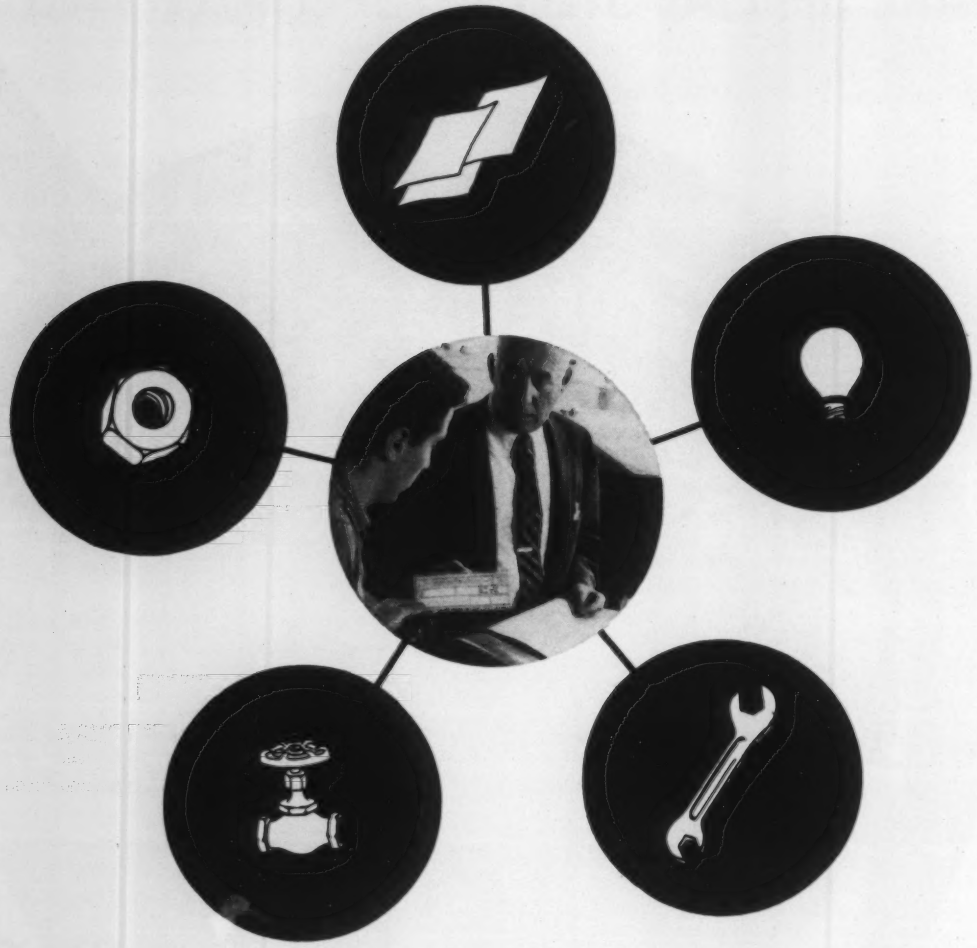

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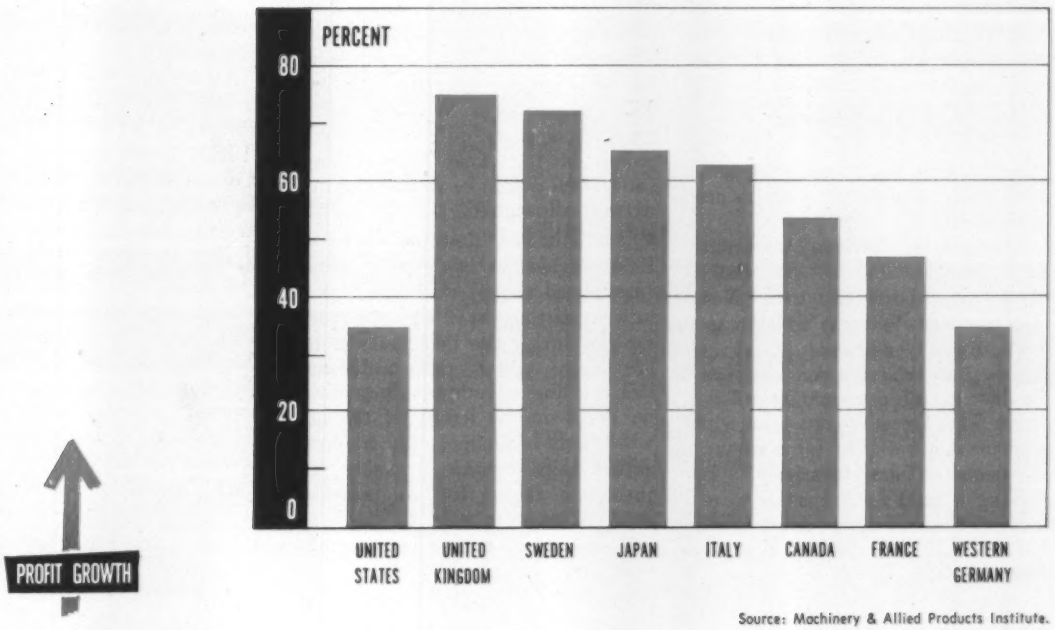
NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

Pressure from Depreciation Throttles U. S. Business

(Percentages written off over equipment's first three service years)



Source: Machinery & Allied Products Institute.

AMERICA'S archaic depreciation laws are forcing U. S. industry to underdepreciate at the rate of about $6.5 billion a year.

Profits are overstated correspondingly, and taxes are paid on the paper earnings.

No real profit growth is possible until we get depreciation reform. Present taxation of capital as income is not only unfair in itself, says the Machinery & Allied Products Institute (MAPI), but it has this profit-killing effect: It retards progress by curtailing funds available for capital investments.

In 1953, MAPI observed that the U. S. had the worst tax depreciation system of any major industrial country in the world. The Internal Revenue Code of 1954, which authorized the use of either double-rate declining balance or sum-of-digits depreciation on newly acquired assets, helped correct the situation. "For the moment, we were more or less abreast of the procession," says MAPI. "Since then, however, we have stayed put, while other countries moved on. It is obvious that once again we are near the tail end." (See the above chart.)

Example: G. M. Stickell, president of Landis Machine Co., shows how depreciation varies between the U. S. and England. "In ten years we write off 120 per cent of the original purchase price of machinery at our English plant," he says. "Using the most favorable method available for our Waynesboro, Pa., plant permits us to write off 95 per cent of the (machinery) purchase price over a 15-year period."

Only one major industrial country, West Germany, allows as slow a writeoff as we do over the first three years. Yet that is a recent development. She put on the brakes last year, after a period of liberality, to slow down what was deemed excessive investment activity.

Experts estimate that no other nation has as much obsolete plant

and equipment as the U. S.—$95 billion worth. How did we get in this predicament? What are the chances of getting out of it?

The odds for reform in this Congress are still good, but the Kennedy administration is pushing an investment credit proposal which is considered by many to be an aspirin remedy when a wonder drug is required.

One reason why the White House wants the investment credit plan: It would mean less tax revenue loss in early years than more general reform, the administration believes. The income question has blocked a thorough overhaul of our tax depreciation system for more than a decade. Study the history of depreciation here, and you'll see why.

How It All Began

Before 1934, the Treasury Department paid little attention to tax depreciation.

The matter became important then because the U. S. needed money to finance the early New Deal projects. With so little to tax in the midst of depression, Congress proposed an arbitrary percentage reduction in all depreciation allowances. The Treasury countered with a proposal to raise the same amount of money "administratively," by making it hard for taxpayers to establish allowances. The proposal was adopted and embodied in Treasury Decision 4422.

"It was a revenue raising device pure and simple," says Joel Barlow, Washington lawyer and tax expert. "It had nothing to do with the merits of one system of depreciation over another."

As interpreted by zealous revenue agents, TD 4422 became a club to force taxpayers into unreasonable patterns of depreciation. Obsolescence was virtually removed as a factor in arriving at the useful lives over which assets could be written off.

The unhealthy situation was compounded by the 1942 edition of the Treasury's Bulletin F. It contains tables purporting to give the "useful" lives of all kinds of assets. The lives are too long because they were based on experience of the 1930s.

But that has proved to be only half the problem. Since the 1940s, inflation has dealt a second blow. Depreciation is based on original cost. That means that a $10,000 tool with a prescribed 20 year life bought in 1941 would cost at least $20,000 today. Under the law only $10,000 could have been set aside at an annual rate.

Half Way Reform

Since 1952, three partial reforms have eased but not solved the problem:

- Treasury regulations and rulings partially reduce the burden imposed by TD 4422. Bulletin F has been almost abandoned. Yet even that is a mixed blessing. Now, useful lives are usually set on a negotiated basis. The result depends on the bargaining skill of the taxpayer and the state of his records. We have ended up with a crazy quilt. Two companies in the same industry can (and often do) have widely varying writeoff allowances.
- The Internal Revenue Code of 1954 provides for two new methods (mentioned above) that permit you to writeoff the cost of an asset more rapidly during the first years of its life than under the traditional straight line technique. They have no effect on the length of the life which may be claimed. The liberalization helps because it makes depreciation timing for tax purposes conform more closely to the way property wears out or becomes obsolescent.
- In 1958, liberalized depreciation allowances were provided on a token basis for annual investments up to $10,000.

"While those were steps in the right direction, they solve the basic problem in only a partial way," says Mr. Barlow. Even with those reforms, your company can be taxed at an actual rate of 80 per cent instead of the statutory rate of 52 per cent, charges Frank V. Olds, Chrysler Corp.'s assistant comptroller. The still inadequate depreciation allowances force corporations to overstate their taxable income.

What's Ahead in Congress?

The House Ways & Means Committee began hearings late last week on President Kennedy's investment credit plan. It provides that from your 1961 tax bill you could deduct:

- 10 per cent of the first $5000 of new investment in plant and equipment.
- 6 per cent of such investments which are in excess of 50 per cent, but not more than 100 per cent, of your current depreciation allowance.
- 15 per cent of such investments which are in excess of current depreciation.

A company that spends $1,250,000 on new plant and equipment in 1961 and has a current depreciation allowance of $1 million would get a $68,000 tax credit under the plan ($500 as the basic 10 per cent credit, plus $30,000 as the 6 per cent credit, plus $37,500 as the 15 per cent credit).

A company that spends $750,000 in 1961 and has a depreciation allowance of $1 million would get a $15,500 credit against the year's taxes ($500 as the basic 10 per cent credit plus $15,000 as the 6 per cent credit). For a detailed description of how the plan works, see STEEL, May 1, p. 23.

The plan is described by President Kennedy as an interim step that "would in no way forego later action on depreciation." Despite the assurance, some observers feel that this will be it. Industrial sentiment is against it for that and other reasons. The major objections:

1. It would place a premium on the bunching and hoarding of capital outlays, with a destabilizing effect on the economy.

2. Most of the credit would be claimed by companies currently expanding capacity and would reward expansion investment, a type of outlay far less in need of stimulation than investment for modernization and improvement.

3. The scheme would have no benefit for at least half the nation's enterprises, particularly small businesses, which are underspending their depreciation accruals.

4. It would add a new complication for corporate planning, already too much bedeviled by tax considerations.

J. E. Workman, president of Latrobe Steel Co., Latrobe, Pa., states the consensus for industry: "We're hoping that the proposal won't materialize—that Congress will hammer out a program of its own that

What Kind of Depreciation Reform?

Industry would accept any of the first five methods described below. No. 1 would have the greatest support, but it's probably too extreme for Congress to enact. No. 2 would be the most popular alternative. The administration backs the sixth plan, investment credit. Technically, it's a tax rebate proposal, not a depreciation reform technique.

1. FIVE YEAR WRITEOFF

Sen. George Smathers (D., Fla.) and Rep. Eugene Keogh (D., N. Y.) have introduced companion bills that would allow a taxpayer to select any period not less than five years over which to depreciate new equipment . . . and not less than three years to write off used equipment.

2. INITIAL WRITEOFF

This could be enacted by changing a few words in Section 179 of the Internal Revenue Code. It allows you to write off 20 per cent of the cost of depreciable property in the first year if the deduction is taken in the year of acquisition and the cost doesn't exceed $10,000. (The limit is doubled in the case of a husband and wife filing a joint return. Each partner in a partnership may also claim $10,000.) The reform would remove the $10,000 ceiling.

3. THE BRACKET SYSTEM

This would abandon the concept of useful lives. Substituted would be brackets, or maximum and minimum limits, for 10 or 15 categories of depreciable assets—as in Canada. You could pick any year within the bracket. Most durable equipment would be in the five-to-ten year group. Original cost would be the basis for computations. The plan would eliminate hassles over useful lives, which are so common now.

4. THE TRIPLE RATE

With this approach, you retain the present useful life concept, but you get faster writeoffs through use of a triple rate declining balance method instead of the currently legal double rate. The plan's major advantage is that it would reduce capital erosion without radically departing from present practices.

5. REINVESTMENT

When the asset is retired, you can deduct from earnings the difference between its value in current dollars and its cost at the time it was acquired. The deduction would be allowed if an equivalent investment is made within two years of retirement. Needed: Close cost accounting and an index, such as the Commerce Department's construction index.

6. INVESTMENT CREDIT

From your tax bill for 1961 you could deduct: 10 per cent on the first $5000 of new investment in plant and equipment; 6 per cent of such investments which are in excess of 50 per cent but not more than 100 per cent of your current depreciation allowance; 15 per cent of such investments which are in excess of current depreciation.

will do us more good."

Even Mr. Kennedy may not object seriously if events take that course. Organized labor objects to depreciation reform but has hinted it will not oppose investment credit (neither will it heartily endorse the plan). Investment credit may be the draw play in a political strategem.

If investment credit doesn't win, will anything? That's the delicate question now. If the protests are too much against investment credit, conceivably nothing could happen on general reform.

Fortunately, Congressional opinion is steadily turning in favor of reform. Chairman Wilbur Mills (D., Ark.) and a majority on his tax-writing Ways & Means Committee support an overhaul. The Treasury Department admits the need, as a result of a survey among corporate taxpayers. Unfortunately, the full results of the query won't be completely tabulated until this summer—at the earliest. Congress may want to go home before it's available.

When all the debate is over, the

Take your stand on depreciation . . .

Write your congressmen plus these committee members

(Correct address: The Hon. . . . . ., Member, U. S. House of Representatives or U. S. Senate, Washington 25, D. C.)

House Ways & Means Committee

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Cecil R. King (D., Calif.)
Thomas J. O'Brien (D., Ill.)
Hale Boggs (D., La.)
Eugene J. Keogh (D., N. Y.)
Burr P. Harrison (D., Va.)
Frank M. Karsten (D., Mo.)
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John Marshall Butler (R., Md.)
Carl T. Curtis (R., Nebr.)
Thruston B. Morton (R., Ky.)

approach that wins will probably be the one that costs us the least in tax revenues.

Maurice E. Peloubet, senior partner in the New York accounting firm of Pogson, Peloubet & Co., says: Canada's 15 year experience with faster tax writeoffs clearly shows that liberalization of depreciation allowances will not impair government revenues. The reason: More liberal amortization stimulates the economy and creates more taxable profits.

He and most other tax experts outside government are arguing for one or another of the first five plans on Page 83.

What You Can Do

You can help the cause if you:

1. Let your congressmen know how you feel about reform.

2. Buttonhole members of the tax writing Ways & Means Committee to let them know where you stand.

3. Continue to sell the need for action to administration officals, particularly in Treasury.

4. Modernize your own depreciation practices and urge that other companies do likewise. Some 30 per cent of large corporations and 43 per cent of small firms don't use liberalized writeoff methods approved in 1954, preliminary findings of the Treasury survey show. Only 22 per cent of the larger corporations and 37 per cent of the smaller ones elected to use the additional first year depreciation allowance enacted in 1958.

5. Seek greater unanimity within industry's ranks on one proposal for reform.

The cause has been harmed in the past by the fervor with which adherents championed their method (and sometimes disparaged another). Any of the first five plans on Page 83 would do the job. STEEL suggests concentration on No. 2 because it would be the easiest to enact.

The Benefits

The U. S. is investing about 4 per cent of its gross national product in new machinery and equipment, while such foreign industrial powers as West Germany, Japan, and Belgium are spending 8 to 10 per cent of their GNP.

Rev. William T. Hogan, S. J., director of Fordham University's Industrial Economics Program, tells STEEL that sound changes in our depreciation laws can reasonably lead to our investing 6 per cent or more of GNP in new equipment. Mr. Peloubet adds that industry will boost its annual spending for machinery by at least $6 billion if a realistic reform bill is enacted.

He continues: "The question is not whether we can afford liberalized depreciation. It is, rather, whether we can afford our present outmoded system which is stifling economic growth, reducing income, and reducing employment opportunities."

MAPI's president, Charles W. Stewart, says: "A major overhaul of the tax structure is absolutely a prerequisite to the continued health and growth of this country."

An overhaul of the depreciation regulations can come by this summer if industry gets to work.

PLAN FOR PROFIT GROWTH

Pressure from Government

On May 22, STEEL will show how U. S. regulatory bodies increasingly affect your profits and will suggest ways to deal with the problem. For a free copy of any or all articles in this series (appearing biweekly since Jan. 16), write: Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

giant guardian...

Four football fields could be laid out on the flight deck of the giant, nuclear-powered U.S.S. Enterprise—the world's largest ship. But size isn't the only dimension that makes the Enterprise outstanding. Pressurized water nuclear reactors, producing over 200,000 horsepower, will drive her at speeds in excess of 25 knots. She will be able to sail the seven seas for several years without refueling.

Carlson corrosion and heat-resistant stainless steel plate was used in this huge Attack Aircraft Carrier, and in her nuclear power plant. The builders of the Enterprise have confidence in the stainless plate produced by Carlson specialists. Exacting quality standards and dependable delivery result from such specialization.

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Our new booklet, "Producing Stainless Steels . . . Exclusively," is available. Write for your copy now.

Photograph of the launching of the U.S.S. Enterprise.
Courtesy of Newport News Shipbuilding & Dry Dock Co.

OFFICIAL U.S. NAVAL PHOTOGRAPH

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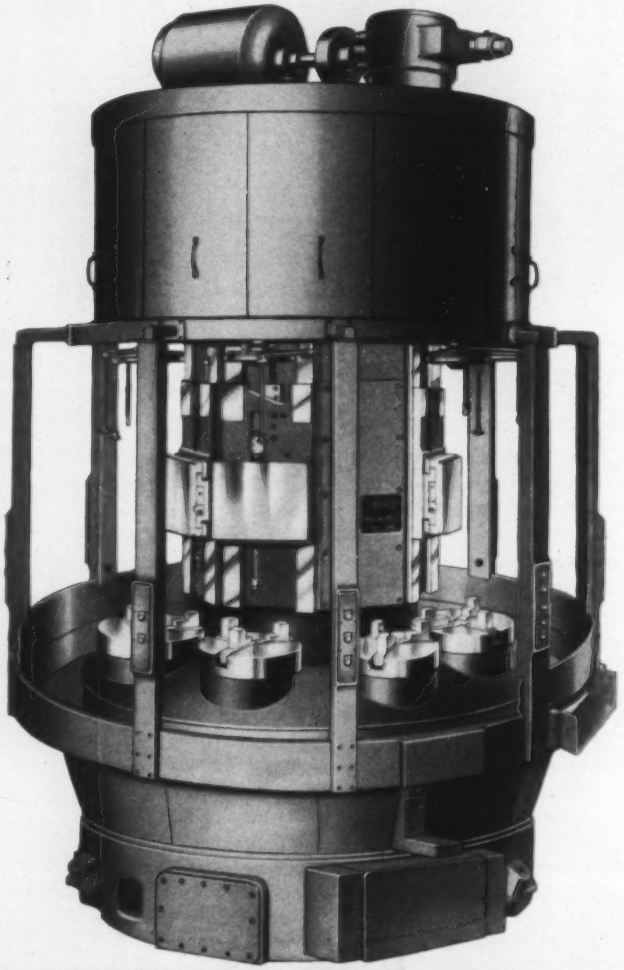

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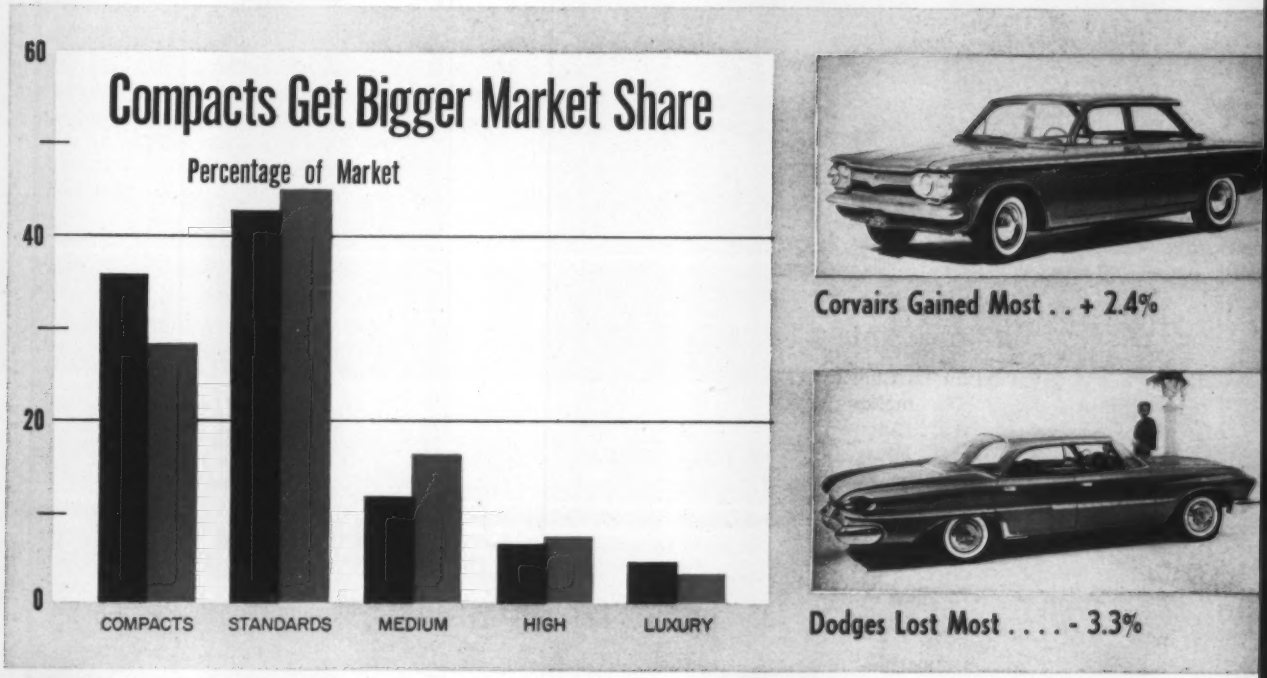

Four months' production adapted from *Ward's Automotive Reports.*

Auto Sales Race Gets Hotter

PRELIMINARY figures indicate auto sales in April were 7 per cent above March's. Registrations in the first four months should total 1.8 million units. That's 300,000 under last year's pace—but still 20 per cent higher than the 1958 mark. Inventories are expected to stay around 900,000. Detroit is scheduling 1.5 million cars for the second quarter—making a first half total of 2.7 million units, 30 per cent less than last year's.

Market penetration is more revealing than unit volume in comparing how various makes are doing this year vs. 1960 when the industry had near record sales. Now that folks are trekking into showrooms, manufacturers are stepping up efforts to win their shares of what still looks like a 5.6 million market for domestic built cars.

• **Big Loser**—Most of the heat so far seems to be on Chrysler. It reported a $21.9 million loss in the first quarter, and its share of the market has been slashed from 13 per cent last year to 11 per cent. Only the Chrysler car line shows any gain in penetration, and that's less than 1 per cent. Dodge has lost more of its market (2.5 per cent) than any car in the industry, but Plymouth's unit sales are off most. From third position last year, Plymouth has dropped to sixth place—behind Pontiac, Rambler, and Oldsmobile. Chevrolet and Ford continue in the first and second spots. Chevy is less than 25,000 units off its record 1960 pace.

Although GM's first quarter net income dropped from $324 million last year to $188 million this year, its share of the 1961 market has climbed from 42 to 46 per cent. Ford's share of sales has climbed from 26 to 28 per cent. American Motors and Studebaker-Packard each show losses in market penetration of less than 1 per cent. AMC's per share earnings for the January-March quarter plummeted from 80 to 12 cents. S-P reports a $6.5 million loss. The industry estimates that imported cars are accounting for 6.6 per cent of the market this year vs. 7.6 per cent in 1960.

• **What Do Buyers Want?**—As the chart (above) shows, the compact revolution isn't over, and buying habits continue to change. Motordom still hasn't figured out all the angles, but it's offering 351 different models.

Discussing the segmented market concept, Herbert Fisher, Lincoln-Mercury Div.'s marketing research manager, points out that while price and size are still vital factors in car buying decisions, they aren't as interrelated as they once were. He says: "Many buyers are willing to pay just as much or even more money for a smaller car than

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Lincoln-Continental Drives for Sales Comeback

AFTER having several so-so sales years with its luxury cars, Ford again has a winner in its Lincoln-Continental which it's marketing this year as a compact luxury car. Four month sales (11,000 units) are 32 per cent above the year ago figure. The division is shooting for 28,000 sales this year. Its market penetration has doubled.

Herbert Fisher, division marketing research manager, says that what delights divisional people most is that half the deliveries are conquest sales—40 per cent are coming from outside the Ford family. What really tickles Ford is that 1 in 5 is a former Cadillac owner.

STEEL tested the 212 in. long Lincoln and found that handling and parking ease are its chief attributes. It seems to be sluggish in the low gear ranges (0 to 45 mph in 7.5 seconds). But that's understandable. Although the car is 15 in. shorter than its predecessor, it is only about 50 lb lighter. Advertised delivered price is $6067 for the sedan, $6713 for the convertible.

Mr. Fisher says that Ford's buyer

HERBERT FISHER
L-M's market research manager

studies confirm that 1961 Lincoln owners find the car gives them an easier ride and is easier to handle than other luxury cars they've owned.

It's only fair to point out that Cadillac sold 149,593 cars last year, while Lincoln had 20,711 deliveries. The GM luxury car is continuing at a comparable pace this year. Lincoln's closest competitor is Chrysler's Imperial. Comparing Lincoln and Imperial sales, Chrysler is selling about a third as many cars as Ford. Chrysler delivered 16,360 Imperials last year. In recent years, the race has been close only once. In 1957, Imperial sales hit 33,017 against Lincoln's 34,808.

for a big one if they feel it gives them the kind of prestige they want and is still useful." Mr. Fisher thinks that status is still important to car buyers. "Our styling research finds more and more buyers prefer what we call tasteful ornamentation on smaller cars. This gives them a new type status in which they get more prestige for less money," he explains. That's why fancy compacts are moving.

• **Which Type Are You?**—Another research revelation the industry is just pinning down: There are at least two basic classes of buyers—possibly more. They might be called "traditionalists" and "modern concept" buyers. The traditionalists still think of the market as it was 20 years ago when we had only low, medium, and high priced cars, and size and price were comparable. They tend to be older than the modern concept buyer, have less formal education, and are often in the bluecollar ranks.

Modern concept buyers are younger, generally have more education, and are more receptive to fashion setting trends. Relating these buyers to the kinds of cars L-M is offering, Mr. Fisher explains: "The smaller Mercury Meteor appeals mostly to the traditionalist buyer who has no second car and wants a standard sized car with a traditional status type name for less money." The Comet appeals to youthful buyers. "It's a car for people with good incomes who haven't had their money too long. A third of the Comet buyers own more than one car," he reports.

A vanishing breed seems to be the traditionalist who trades up from standard sized cars to the larger Mercurys, Buicks, and Oldsmobiles. Mr. Fisher points out that the upper medium price group now accounts for only 7 to 8 per cent of sales.

• **More Shifts Coming** — Looking ahead, Mr. Fisher thinks the biggest growth area will be for cars below the Ford, Chevrolet, and Plymouth in size and price. It's no secret that Ford plans to fill another market segment with its Canadian X and Y cars this fall (STEEL, Apr. 10, p. 79). A similar offering is programed by Chevrolet.

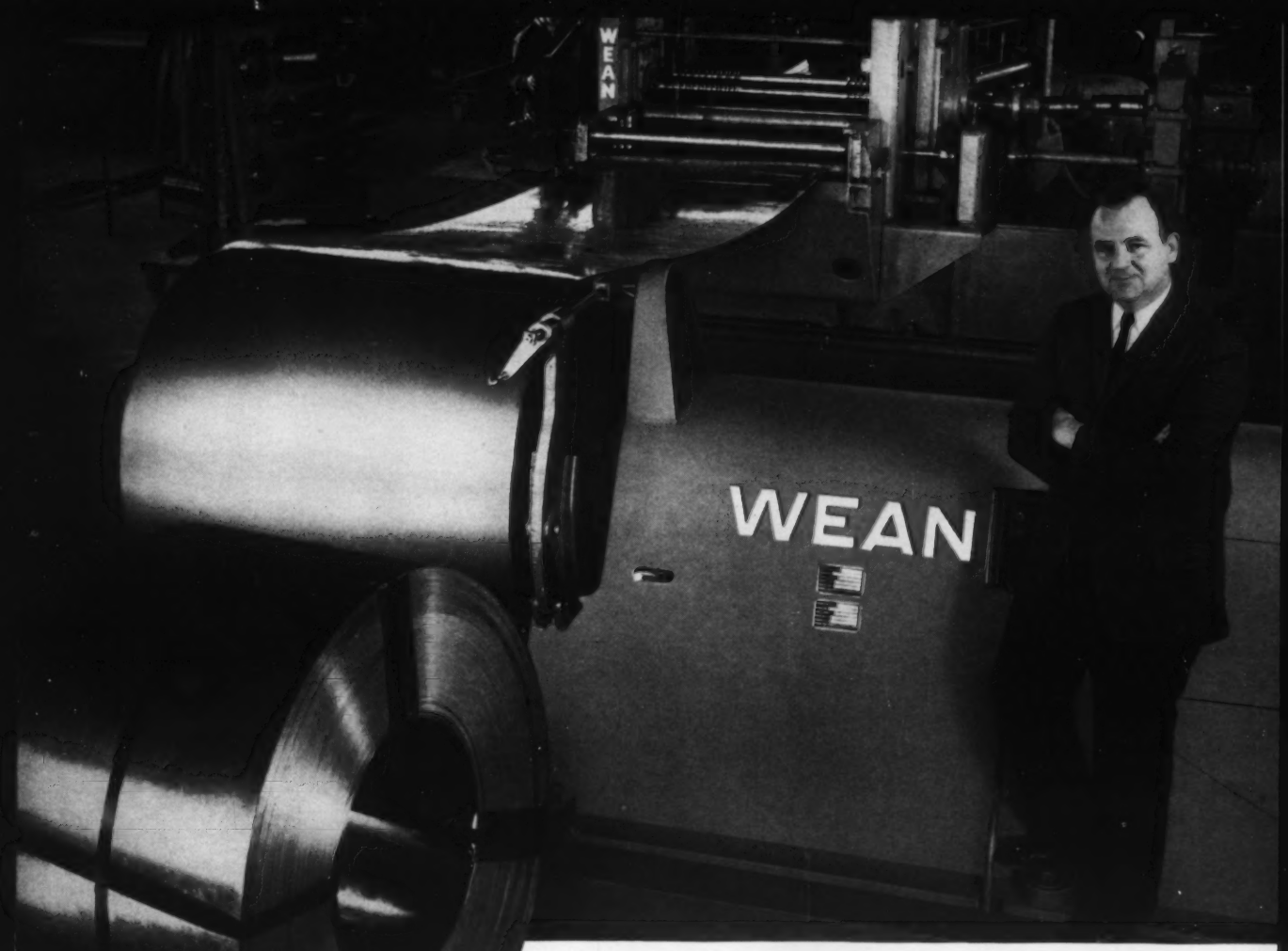
U. S. Auto Output

Passenger Only

	1961	1960
January	415,857	688,690
February	364,385	659,298
March	407,959	654,242
3 Mo. Totals	1,188,201	2,002,230
April		582,909
May		611,226
June		613,147
July		434,377
August		305,527
September		407,685
October		617,816
November		597,132
December		522,239
Total		6,694,288

Week Ended	1961	1960
Apr. 1	101,571	147,830
Apr. 8	93,730	133,460
Apr. 15	114,108	135,412
Apr. 22	124,459	144,886
Apr. 29	114,331†	135,515
May 6	118,000*	142,091

Source: *Ward's Automotive Reports.*
†Preliminary. *Estimated by STEEL.



JOSEPH RAFFERTY, JR., President of Rafferty-Brown Steel Co., Inc., says:

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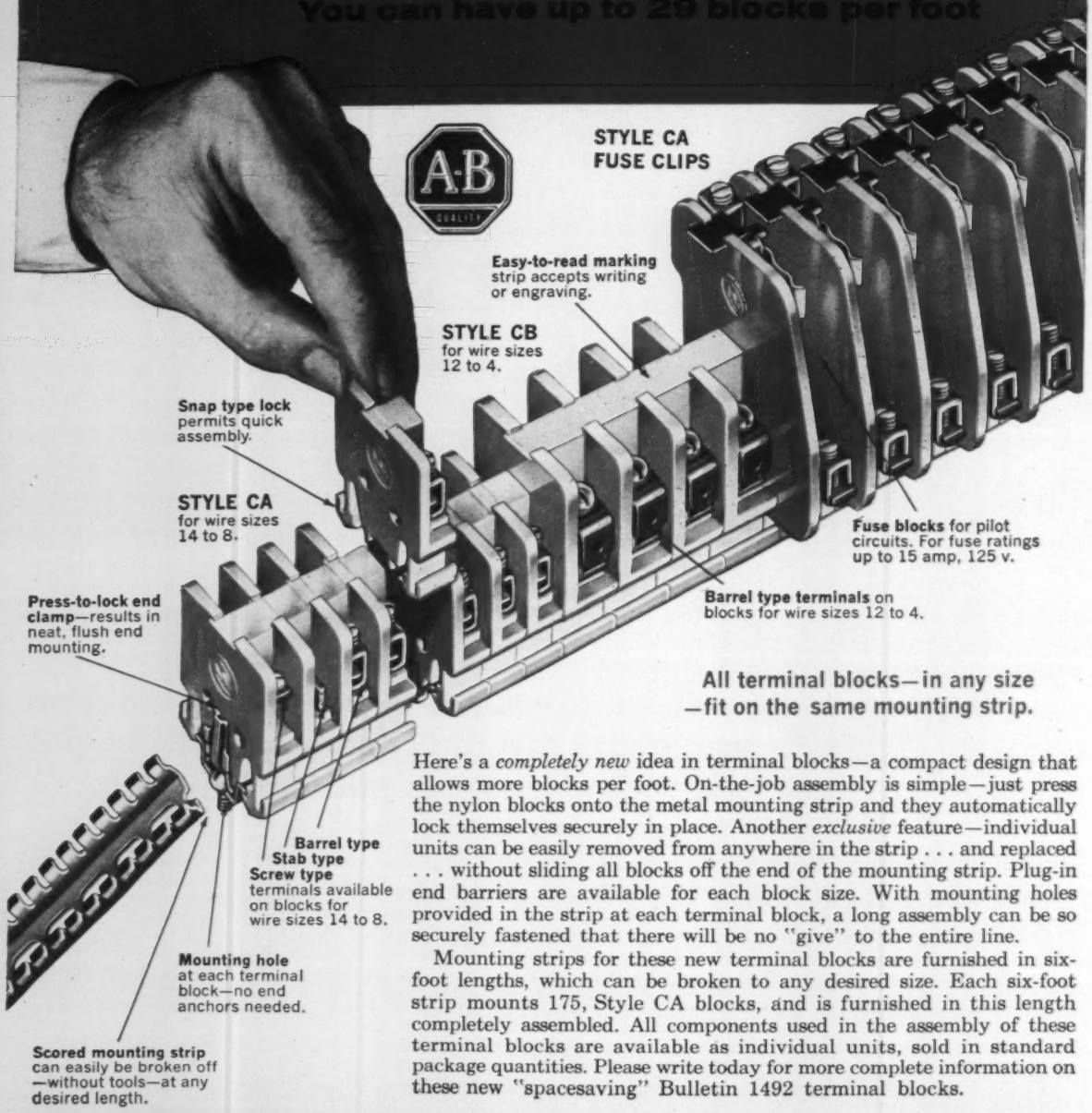

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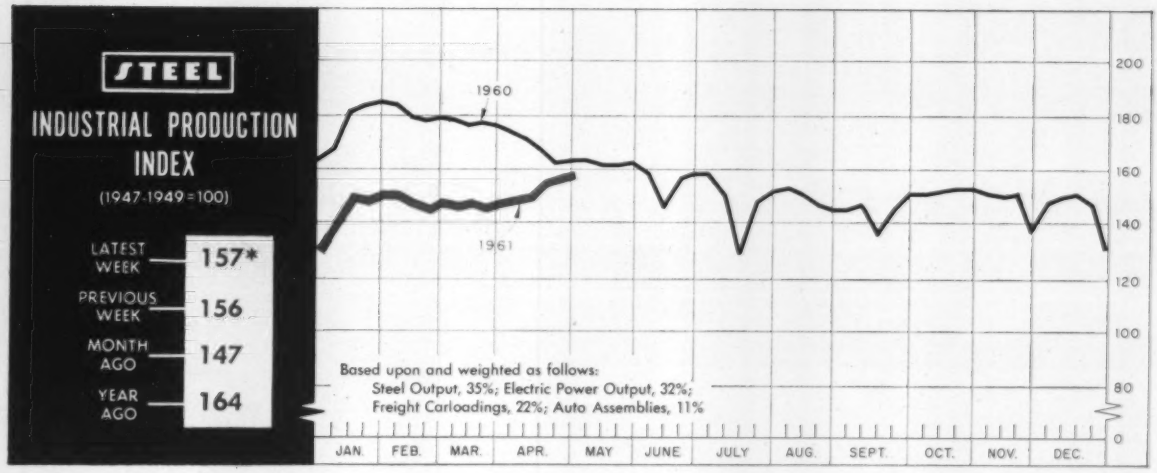

*Week ended Apr. 29.

Industrial Production Hits '61 High

ANOTHER WEEK, another point, and STEEL's industrial production index moves into new high ground for the year.

The persistent rise which began in the final week of March carried the trend line to a preliminary 157 (1947-49=100) in the week ended Apr. 29.

Not only is it the highest point reached by the index since late last June; it is also the longest upward movement (six weeks) since the rebound from the steel strike in 1959. Even more important: It is no fluke, or a seasonal reaction. Support comes from across the board, and it's in more than seasonal quantities.

• **Strong as Steel** — The primary impetus is coming from the steel industry, which has increased its output weekly since the middle of March. In that time, production has gone from 1,573,000 net tons a week to an estimated 1,900,000 net tons in the week ended May 6, an increase of 21 per cent.

In the steel industry itself, the recovery has also been across the board.

Steel users who have been out of the market for many months find that their stocks are dangerously low, if not depleted. Right now, they are buying in small quantities for consumption, but as production increases (new orders for durables have advanced two consecutive months) there will be more buying for both consumption and inventory.

• **Life in Autos**—Even motordom is lending support to the steel industry and the over-all production index. Late in the first quarter it was supposed that automakers had all the steel they needed to round out 1961 model production. Then sales started climbing; new car stocks came down; and production schedules were revamped upward. Steel tonnage scheduled for May delivery was pushed back into April, and

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)	1,900[1]	1,858	2,137
Electric Power Distributed (million kw-hr)	14,300[1]	14,311	13,300
Bituminous Coal Output (1000 tons)	7,480[1]	6,990	8,668
Crude Oil Production (daily avg—1000 bbl)	7,245[1]	7,245	7,014
Construction Volume (*ENR*—millions)	$555.0	$457.5	$493.1
Auto, Truck Output—U. S., Canada (*Ward's*)	147,930[1]	158,288	172,971
TRADE			
Freight Carloadings (1000 cars)	545[1]	533	643
Intercity Truck Tonnage (changes from year ago)	−1.1%	+0.9%	−4.8%
Business Failures (Dun & Bradstreet)	320	383	283
Currency in Circulation (millions)[2]	$31,807	$31,980	$31,581
Dept. Store Sales (changes from year ago)[2]	−1%	−17%	+4%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$28,625	$31,476	$26,398
Federal Gross Debt (billions)	$288.6	$288.6	$289.1
Bond Volume, NYSE (millions)	$31.7	$37.4	$26.5
Stocks Sales, NYSE (thousands of shares)	22,401	24,717	14,973
Loans & Investments (billions, adjusted)[3]	$109.7	$109.2	$103.6
U. S. Govt. Obligations Held (billions)[3]	$30.0	$29.4	$26.2
PRICES			
STEEL's Finished Steel Price Index[4]	247.82	247.82	247.82
STEEL's Nonferrous Metal Price Index[5]	215.1	215.4	230.7
All Commodities[6]	119.4	119.5	119.8
Commodities Other than Farm & Foods[6]	128.1	128.0	128.6

*Dates on request. [1]Preliminary. [2]Federal Reserve Board. [3]Member Banks, Federal Reserve System. [4]1935-39=100. [5]1936-39=100. [6]Bureau of Labor Statistics Index, 1947-49=100.

Number One in

Music Spring Wire

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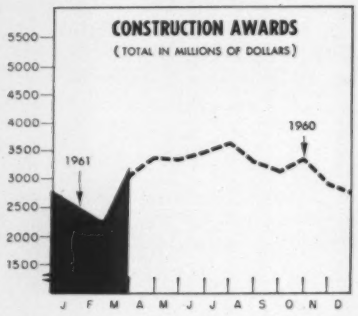
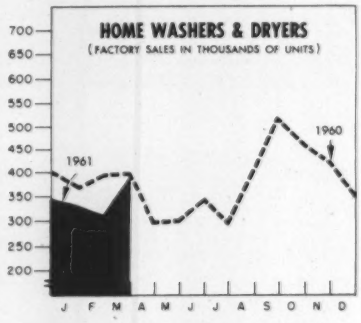
THE BUSINESS TREND





	Total		Building	
	1961	1960	1961	1960
Jan.	2,485	2,193	1,787	1,728
Feb.	2,235	2,240	1,674	1,685
Mar.	3,166	3,046	2,398	2,361
Apr.	....	3,360	....	2,527
May	....	3,337	....	2,563
June	....	3,472	....	2,593
July	....	3,597	....	2,481
Aug.	....	3,295	....	2,550
Sept.	....	3,119	....	2,402
Oct.	....	3,319	....	2,555
Nov.	....	2,886	....	2,169
Dec.	....	2,718	....	1,872
Totals	....	36,318*	....	27,345*

*Monthly figures do not add up to totals because of yearend revisions.
F. W. Dodge Corp.
Charts copyright, 1961, STEEL.

	Washers		Dryers	
	1961	1960	1961	1960
Jan.	228,919	254,900	103,158	111,600
Feb.	227,562	283,900	81,340	108,400
Mar.	305,590	306,000	82,093	90,200
Apr.	.....	236,200	.....	53,200
May	.....	244,200	.....	53,700
June	.....	277,300	.....	64,900
July	.....	217,700	.....	72,600
Aug.	.....	296,500	.....	105,100
Sept.	.....	352,700	.....	165,500
Oct.	.....	305,800	.....	151,900
Nov.	.....	275,300	.....	142,000
Dec.	.....	223,500	.....	119,200
Totals	.....	3,274,000	.....	1,238,200

American Home Laundry Mfrs. Assn.

new orders filled in the holes left in May.

Assembly lines may have hit their spring peak in April, but they will not slough off too much in May. If the April trends continue (sales climbed 9 per cent above the month earlier period in the second ten selling days, and inventories held at about 935,000 units), it is highly unlikely that output will decline to the low February-March level until just before model changeover.

• **Railroaders Worried** — Railroad freight carloadings have gained slightly in the last three weeks, but not as much as many industry observers expected. "Where's the turnup in the economy?" asked one Midwest official. "We haven't seen it reflected in the volume of freight we're handling."

In the forecast for the second quarter, the 13, regional shipper advisory boards predicted a 5.6 per cent decline from the year-ago period, reflecting last year's concentration of steelmaking and ore handling in the first half, plus a cautious attitude about this year's prospects. But so far, loadings have been about 15 per cent below the 1960 pace, largely because of the slow start in iron ore shipments.

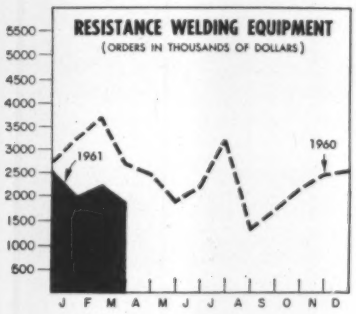
If the shippers are right, an upturn of sizable proportions is in store before the second half is over.

• **Power Pulling Away**—Even output of electric power, which usually adds little or nothing to the industrial production index at this time of the year, is helping out. Production advanced during April, the first time that has happened since 1956. Four weeks ago, the industry had a slight edge of about 1 per cent over the 1960 figures. Today, the advantage is close to 6 per cent.

If present trends continue through May, it is likely that STEEL's industrial production index will climb above the 1960 line before the month is over. A clue to the real strength of the upturn may come in the last week of this month when Memorial Day falls on a Tuesday. If many companies pull back operations on Monday, it may be a good idea to re-evaluate the recovery.

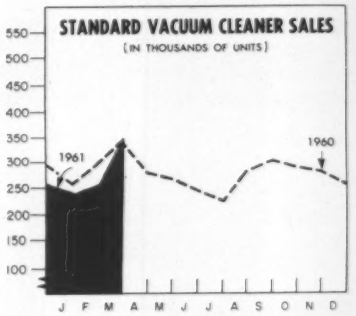
Weather Holds Back Spending

Those who are counting on the consumer to play an important part in the upturn are discomfited by



	Net Orders 1961	Net Orders 1960	Shipments 1961	Shipments 1960
Jan.	2,013	3.258	1,731	1,582
Feb.	2,236	3.732	1,916	2.563
Mar.	1,871	2,653	2,739	3.011
Apr.	....	2,446	....	2.943
May	....	1,871	....	2.310
June	....	2,205	....	3.267
July	....	3.244	....	2.221
Aug.	....	1,330	....	2.528
Sept.	....	1,689	....	2.559
Oct.	....	2,145	....	2.328
Nov.	....	2,457	....	1,927
Dec.	....	2,525	....	1,974
Totals	....	28,933	....	29,218

Resistance Welder Manufacturers' Assn.



	1961	1960	1959
Jan.	242.515	258.330	242.516
Feb.	257.930	291.483	271.396
Mar.	349.972	339.918	346.557
Apr.	.....	278.391	317.402
May	.....	265.556	257.315
June	.....	245.790	275.974
July	.....	223.008	221.232
Aug.	.....	280.575	268.165
Sept.	.....	301.935	305.096
Oct.	.....	290.039	330.899
Nov.	.....	280.550	290.130
Dec.	.....	254.631	293.818
Totals	.....	3,313,226	3,420,830

Vacuum Cleaners Mfrs. Assn.

weather reports but heartened by trends in income which eventually should make themselves felt. In much of the Midwest and East, rain has kept consumers away from the stores. Cumulative department store sales so far this year are no better than even with a year-ago.

But once the weather improves, things should change. Spendable earnings in March moved up slightly over the February total while consumer prices stayed even. The Department of Labor says that factory workers gained almost 1 per cent in purchasing power during the month. With the workweek lengthening in April and May, money should be even more available, and it is a demonstrated fact that over the long haul consumers will spend at least 92 cents of every dollar earned.

Building Contracts Climb

Construction still gives every indication that it will be one of the big leaders in the recovery of 1961. F. W. Dodge Corp. reports that residential and heavy engineering construction awards in March topped the February total by 4 per cent. (See graph and table, Page 92.) That pushed the first quarter total to $7.9 billion, 6 per cent ahead of the year-ago figure.

"A particularly encouraging note," declared Dr. George Cline Smith, Dodge vice president and economist, "was the 5 per cent gain over a year ago in the number of dwelling units . . . with the exception of last November, this was the first such gain in 19 months."

Dun & Bradstreet Inc. reports that building permits issued in 200 cities in March rose to $688.9 million, the highest since last September. It missed the year ago mark by 1.9 per cent. But the first quarter total still nosed out the corresponding figure for 1960.

Structural steel fabricators also saw their new order positions strengthen in March. Bookings jumped 15 per cent over February's to 295,739 tons. Shipments climbed 12 per cent during the month.

Contract activity in early April slacked off some, but managed to end the month on the uptrend. During the week ended Apr. 27, heavy construction contracts boomed up to $555 million, the second best week of the year, says *Engineering News-Record*. Despite this strength, the month as a whole slipped to 9 per cent below the April, 1960, total.

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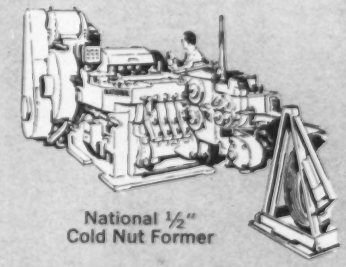

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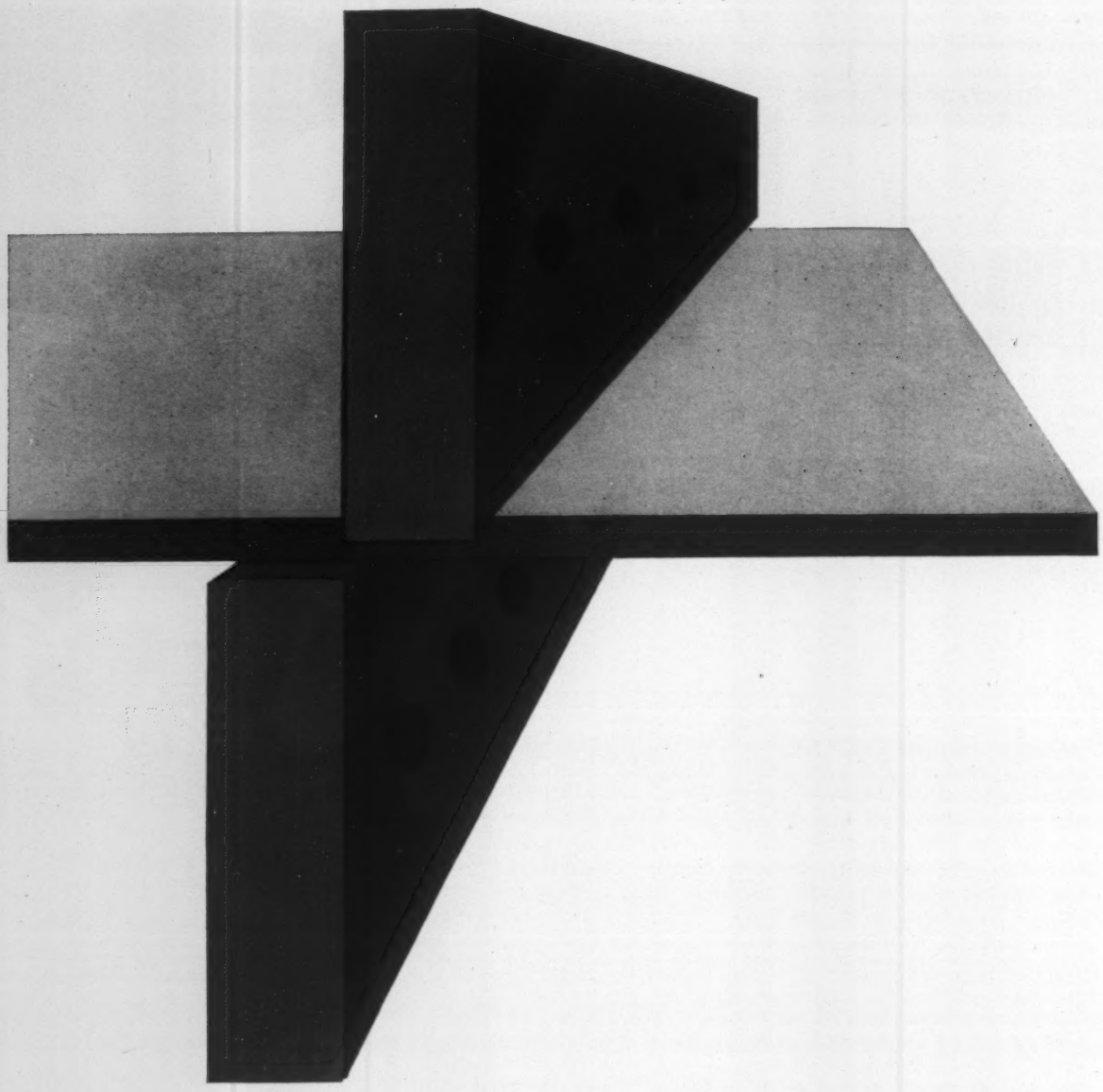
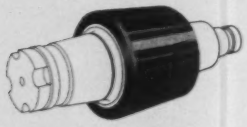


Heppenstall rolls it, cuts it, handles it



Back-up roll sleeves and rolls

Side trimmer knives

Motorized sheet lifter

In the steelmaking industry — from melt shop to finished product — Heppenstall back-up roll sleeves and rolls, knives and tongs are proving their high performance value. To maintain such standards, Heppenstall has modern laboratories in each product division. All products are constantly checked — and intensive research is carried on to improve present products and to develop new ones. Heppenstall Representatives are fully experienced in the selection and application of our products to meet your problems. For service or specific information, call our nearest Representative or write us direct.

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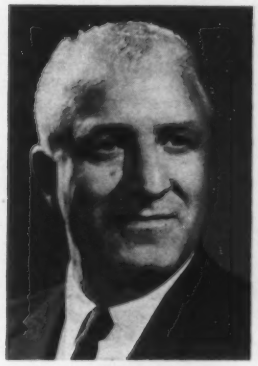
MIDVALE-HEPPENSTALL COMPANY
NICETOWN, PHILADELPHIA 40, PA.

H M H

D. E. STONER
Landis Machine works mgr.

HAROLD ETHERINGTON
A-C Atomic Energy gen. mgr.



ANTHONY R. CLAYTON
General Dynamics div. post

NORMAN H. PETERSON
Timken Roller Bearing post

D. E. Stoner, former works manager, Landis Tap Div., was appointed works manager at **Landis Machine Co.**, Waynesboro, Pa. He succeeds **Leon H. Randolph**, retired.

Harold Etherington was made general manager, Atomic Energy Div., **Allis-Chalmers Mfg. Co.**, Milwaukee. He succeeds **Roy M. Casper**, vice president, recently made general manager, Power Equipment Div.

Benjamin T. Hill Jr. was appointed product manager-silicon steels at **Allegheny Ludlum Steel Corp.**, Pittsburgh. He was assistant to vice president-sales.

John A. Anderson was made manager of **Young Spring & Wire Corp.'s** Chicago plant. He joined the Automotive Div. last year as general superintendent. He was production manager at Warwick Mfg. Corp.

Allan B. Chirgwin was made chief engineer of **Farrel-Birmingham Co. Inc.**, Buffalo.

Ernest Currie was made sales manager for **Precision Castings Co.'s** Chicago office.

R. G. Martinek was named product sales manager, furnace and oven product lines, **Hevi-Duty Electric Co.**, Watertown, Wis. He continues as manager-special industrial furnace sales. **C. A. Newton** was made product manager, light industrial furnace line. Hevi-Duty is a division of Basic Products Corp.

Anthony R. Clayton was made director of manufacturing, Rochester, N. Y., facilities of the Military Products Div., **General Dynamics/Electronics**, division of General Dynamics Corp. He succeeds **William Lawrence**, recently made general manager in the division's San Diego plant.

Virgil R. Stump was made general manager, Detroit Div., **Dana Corp.**, to succeed **Harry Schultz**, who will retire later this year, but will be available as a consultant.

Walter I. Krewson Jr. was appointed president, **Superior Pneumatic & Mfg. Inc.**, Cleveland. **Kenneth Lang** was named vice president-director of sales.

Bailey Meter Co., Cleveland, elected **H. H. Gorrie** executive vice president; **L. F. Richardson** vice president-sales; and **J. H. Dennis** vice president in charge of all manufacturing and plants.

Norman H. Peterson was appointed assistant to the president of **Timken Roller Bearing Co.**, Canton, Ohio. He is succeeded as advertising manager by **John H. Fellows. H. Clare Shepard** was made sales promotion manager.

Osborn Mfg. Co., Cleveland, named **E. K. Hatch** manager, **E. J. Texler** sales manager of the Machinery Div.

Anthony L. Ascik was elected vice president, **Tennessee Products & Chemical Corp.**, Nashville, Tenn. He heads alloy and metal operations.

T. F. Sharpe was made chief engineer, Ithaca, N. Y., plant of **Morse Chain Co.** He is replaced as assistant chief engineer by **Harold R. Fisher.**

M. C. King and **Jay I. Dodson** were made assistant superintendents, Metallurgical Dept., at **Kaiser Steel Corp.'s** Fontana, Calif., plant. **Wal-**

H. H. GORRIE

L. F. RICHARDSON

J. H. DENNIS

Bailey Meter promotes three executives

C. H. GODSCHALL

F. L. BREDIMUS

Symington Wayne vice presidents

EDWIN J. KEYES

G. HARDING ALLEN

Heald v. p.-mfg. and works manager

ter L. Saccani was made assistant superintendent, Open Hearth Dept.

Symington Wayne Corp., New York, appointed **C. H. Godschall** vice president-manufacturing and **F. L. Bredimus** vice president-sales. Mr. Godschall was vice president-planning and production of Wayne Pump Div., Salisbury, Md. Mr. Bredimus continues as president of the subsidiary, Globe Hoist Co., Philadelphia.

William C. Arthur was elected president and chief executive officer of **Anderson Corp.**, Worcester, Mass. He succeeds **Brent R. Anderson,** now chairman and consultant to the firm.

A. H. Hanks was named general manager-bar, wire, and tube production for **Allegheny Ludlum Steel Corp.**, Pittsburgh. He was manager, Watervliet, N. Y., Works. **W. R. Breeler,** general manager of the plant at Dunkirk, N. Y., was named president of Allegheny Ludlum International S. A., with headquarters in Geneva, Switzerland, effective July 1.

Ted E. Gaty, formerly with Line Materials Industries, joined **Standard Transformer Co.**, Warren, Ohio, as sales manager. **Joseph A. Buchsbaum** has resigned.

At the Batavia, N. Y., plant of **Doehler-Jarvis Div.**, National Lead Co., **Arne E. Swanson** was made assistant plant manager; **Clyde A. Wilcox** works manager.

Thomas D. Bushman was made product manager - semiconductor processing equipment at **Norton Co.'s** Machine Tool Div., Worcester, Mass.

Charles J. Hunter was appointed chief metallurgical engineer of operations-steel, **United States Steel Corp.**, Pittsburgh. Former general superintendent, South Works, Chicago, he is succeeded by **William E. Haskell. Howard A. Parker** replaces Mr. Haskell as assistant general superintendent.

Edwin J. Keyes, former vice president-works manager, **Heald Machine Co.**, Worcester, Mass., was made vice president-manufacturing. **G. Harding Allen** was made works manager. The company organized into two main divisions by product line—Grinding Machine Div., and Bore-Matic Machine Div. **A. Francis Townsend,** former vice president-engineering, was named vice president-manager, Grinding Machine Div. **Albert A. Arbogast,** former Detroit branch sales manager, was made manager, Bore-Matic Machine Div.

Richard E. Button was made vice president-general manager, **Regent Die Casting Co.**, Chicago. He was a sales engineer for Central Die Casting & Mfg. Co. Inc.

John Holding was named vice president and manager of manufacturing, **Ravens-Metal Products Inc.**, Parkersburg, W. Va.

Wesley H. Sowers was elected executive vice president, chemical and

A. H. HANKS

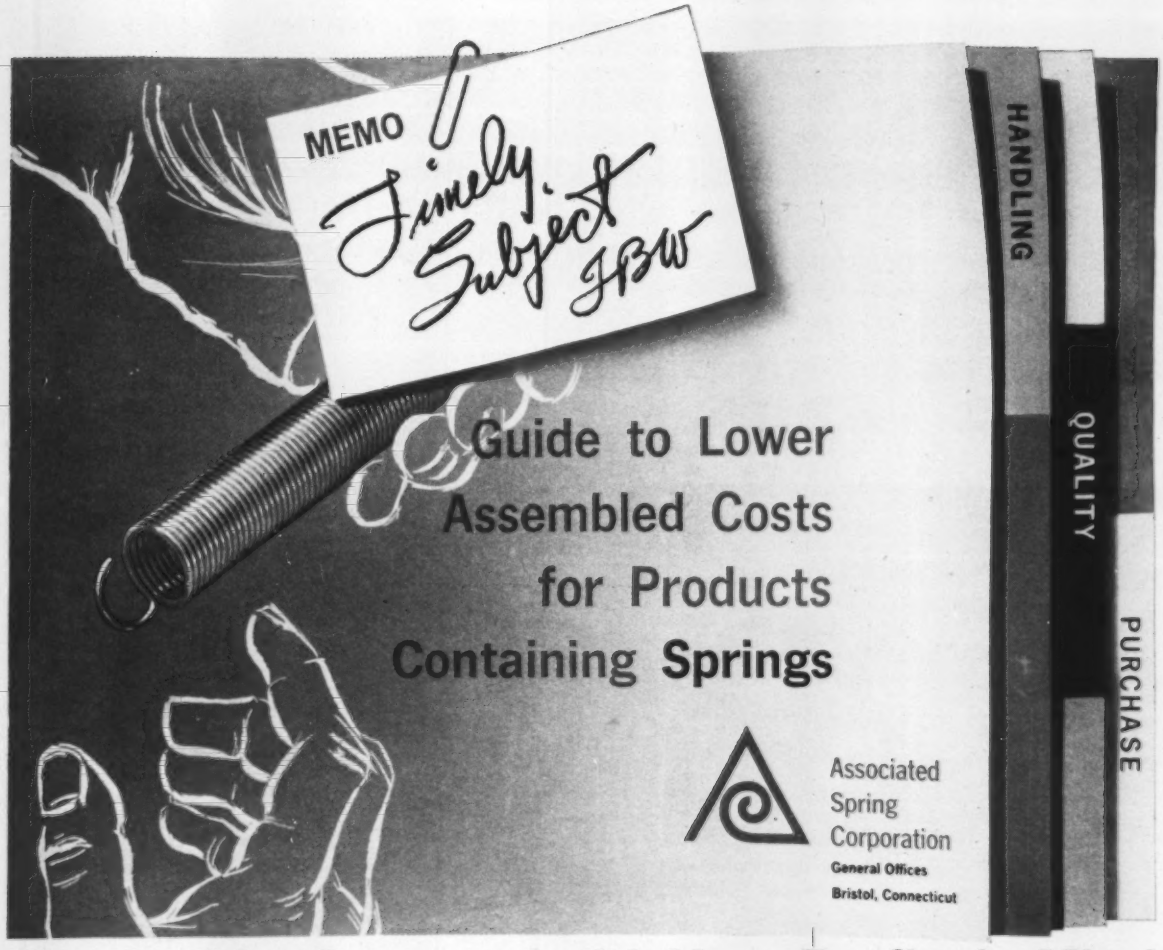
W. R. BREELER

Allegheny Ludlum management appointments

CHARLES J. HUNTER

WILLIAM E. HASKELL

U. S. Steel appointments



The Booklet Prepared with Your Profits in Mind

Success of a product in today's markets is often determined by progressive reduction of its assembled cost.

Springs, often overlooked in the over-all cost of many products or assemblies, represent significant opportunities for potential savings in the assembly function—especially in handling, quality, and procurement. This booklet details in each category how Associated Spring Corporation might help effect worthwhile cost reductions in the assembling of products using springs and related items. A free copy awaits you. Use the coupon at the right.

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Bristol, Connecticut

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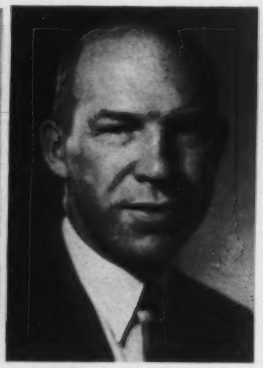
Wallace Barnes Steel Division, Bristol, Conn.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
Cleveland Sales Office, Cleveland, Ohio
Chicago Sales Office, Chicago, Ill.
Wallace Barnes Co., Ltd., Hamilton, Ont. and Montreal, Que.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Mattoon, Ill.
Milwaukee Division, Milwaukee, Wis.
Seaboard Pacific Division, Gardena, Calif.

WILLIAM V. SPURLIN
Syntron vice president

JOHN J. RICH
American-Standard post



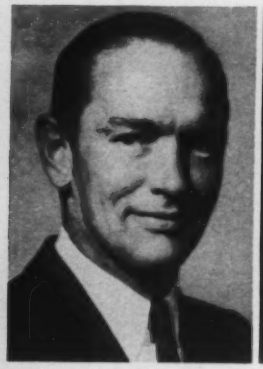
ROBERT S. JONES
Jones & Lamson v. p.

JOHN S. FRENCH
Ford-Motorcraft Div. mgr.

G. FINDLEY GRIFFITHS
Acme Steel chief executive

W. C. WERNET
Baxter Steel Equip. v. p.

BRUCE O. YOUNG
Crucible carbon-alloy post



SPENCER D. MOSELEY
Gen. American Transportation

WILLIAM A. STEELE
Wheeling Steel chairman-pres.

metallics, at **Vulcan Materials Co.**, Birmingham.

Bruce O. Young was made manager, Carbon & Alloy Specialties Product Div., Pittsburgh, **Crucible Steel Co. of America.**

Charles M. Hargraves was named manager, Industrial Equipment Div., **R. C. Mahon Co.**, Detroit.

T. M. Thompson was elected chairman and chief executive officer, **General American Transportation Corp.**, Chicago. He is succeeded as president by **Spencer D. Moseley**, former assistant to the president. Mr. Thompson succeeds **Sam Laud**, named chairman of the executive committee. **Robert G. Biesel** was made executive vice president.

William V. Spurlin was named vice president and chief engineer at **Syntron Co.**, Homer City, Pa. He succeeds **E. J. Missien**, retired vice president-engineering. Mr. Spurlin has been chief engineer since 1958.

John J. Rich was made manager of the Dearborn, Mich., plant of **American-Standard Industrial Div.**, American Radiator & Standard Sanitary Corp. He was plant materials manager.

Robert S. Jones, general manager, **Jones & Lamson Machine Co.**, Springfield, Vt., was elected vice president-general manager.

John S. French was named general manager of the newly formed Motorcraft Div. of **Ford Motor Co.**, Dearborn, Mich. He continues temporarily as general manager, Hardware & Accessories Div.

G. Findley Griffiths was elected president and chief executive officer, **Acme Steel Co.**, Chicago. **Guy T. Avery** remains as chairman until retirement Nov. 1.

W. C. Wernet was made vice president, **Baxter Steel Equipment Co.**, Indianapolis, division of Keyless Lock Co. Inc. He was sales administration manager, Utica Div., Curtiss-Wright Corp.

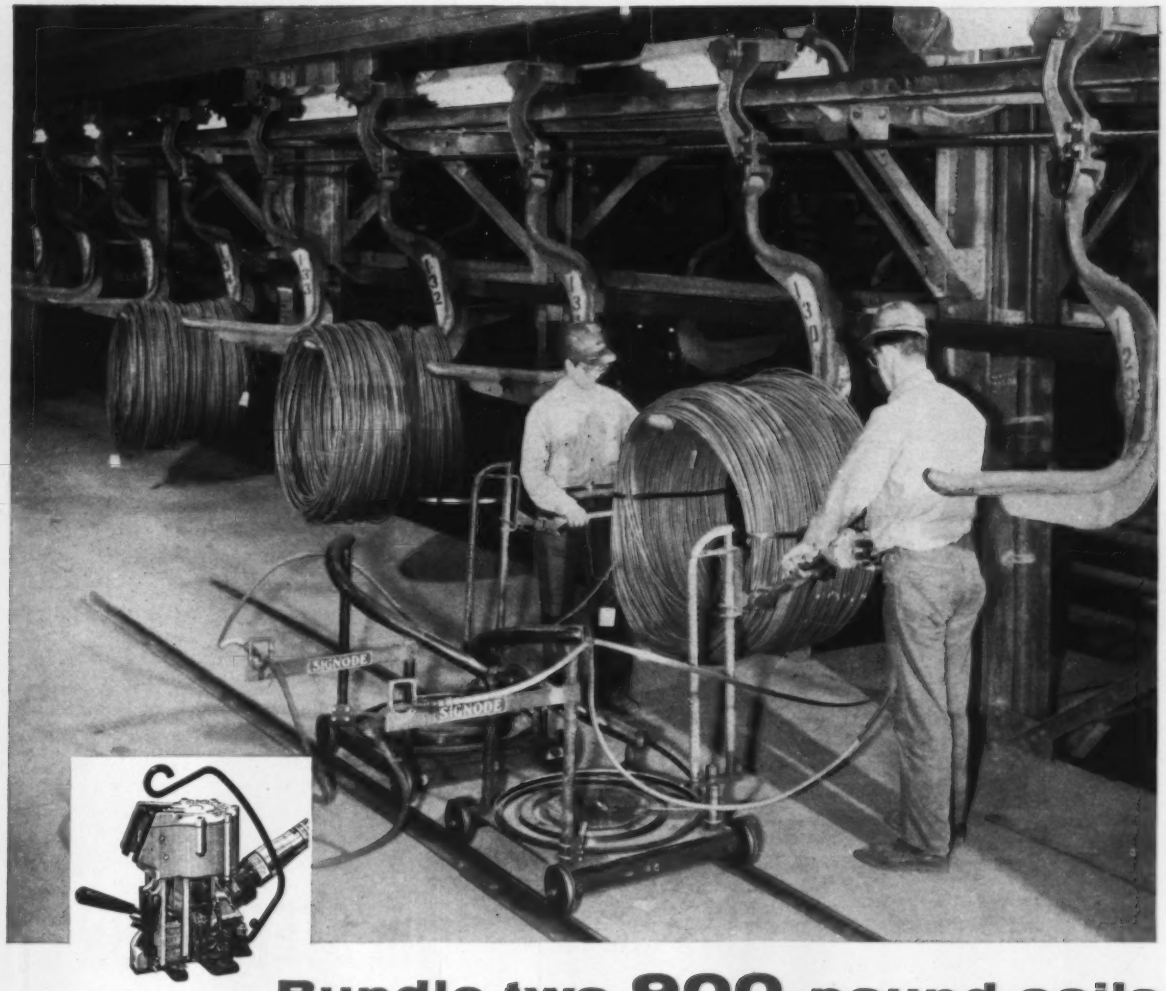
William A. Steele, president and chief executive officer, **Wheeling Steel Corp.**, Wheeling, W. Va., also assumes the post of chairman, succeeding **John L. Neudoerfer**, retired.

Olney P. Ross was named head of **Cambridge Wire Cloth Co.'s** Conveyor Belt Sales Dept., Cambridge, Md., and **Joseph E. McKnett** was made head of the Wire Cloth Dept.

OBITUARIES...

Gordon Murphy, 49, vice president-manufacturing, **Foote Bros. Gear & Machine Corp.**, Chicago, and vice president of the subsidiary, **Whitney Chain Co.**, Hartford, Conn., died Apr. 26.

Donald R. Moore, 45, vice president-sales, **National Spectrographic Laboratories Inc.**, Cleveland, died Apr. 10.



Bundle two 900-pound coils on moving conveyor in 30 seconds

Two operators—each using a Signode AMP all-power strapping tool and working in unison—put two steel straps around two 900-pound coils of green rod in 30 seconds!

This setup, which permits making full use of the speed of the AMP, was developed by the manufacturer. It incorporates a mobile strapping station that rolls on tracks paralleling the conveyor line. As the operators work, they move along with the conveyor hook that holds the two coils being strapped. When the strapping operation is completed, they move back to the starting point...30 seconds later. Coils are compressed 30% by the strapping.

The Signode AMP is compact, well-balanced, weighs only 22 pounds. Press a trigger and air power tensions the strapping; press another and air power seals and cuts off the strapping from the coil. The AMP uses new, easy-loading NESTACK seals, which come in nested stacks that eliminate waste and delay. The tool is available for ⅝″ and ¾″ strapping, .015″ to .035″ gauge. Special high-tension models are available.

Let us send you additional information on the Signode AMP tool, or, if you prefer, call the Signode man near you.

First in steel strapping

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STEEL STRAPPING CO.
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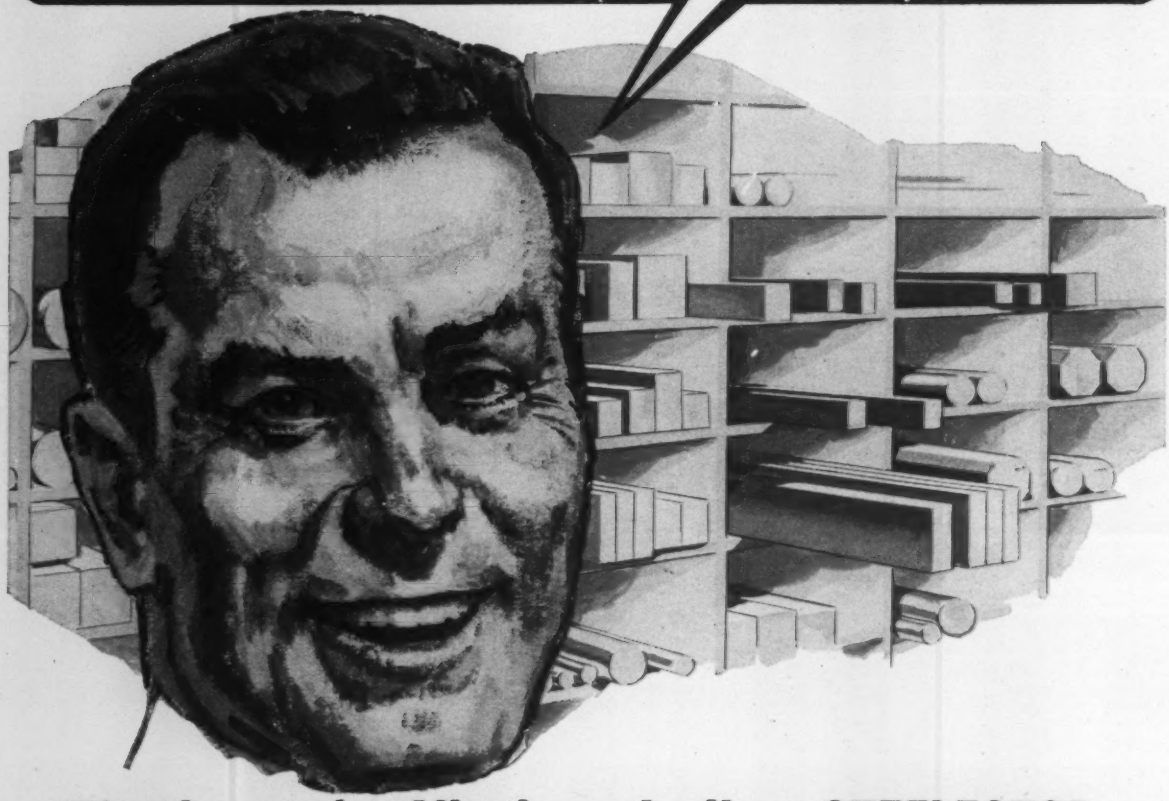
"I Know Every Tool Steel Grade and Size in Warehouse Stock"



Thanks to the Allegheny Ludlum STEELECTOR

"We simplified tool steel selection immensely when we started using the A-L STEELECTOR System. It slashed our selection time to seconds. And our local warehouse always has the grade and size we need in stock—ready for immediate delivery.

"Here's how we use the STEELECTOR System: We check bar graphs of the STEELECTOR Card for the job at hand (there are cards for hot work, high speed, and tool room grades) to compare the abrasion resistance, toughness, size stability, machinability, and red hardness of the STEELECTOR grades. In seconds we can pick the best combination of properties.

"We confirm our selection with the STEELECTOR Data Stock List. (There is a List for each STEELECTOR grade.) The Data Stock List itemizes every size and shape in stock. It tells us before we order that the particular grade and size we need is ready for immediate delivery. The STEELECTOR System and quick warehouse delivery have enabled us to reduce our own inventory.

"The Data Stock Lists also tell us proper hardening, tempering, and annealing temperatures. The steel analysis and AISI number are listed along with a description of the steel's properties. And a list of suggested working hardnesses for typical applications serves as a check on our use of the grade."

The STEELECTOR System is remarkably easy to use. If you haven't investigated it yet, ask your A-L representative for your copy of the colorful, 10-page STEELECTOR Booklet, or write: ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*** Address Dept. S-5.

9241

STEELECTOR PROGRAM

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

Capacity for Heat Treating Plates Raised at Homestead

U. S. STEEL CORP. has installed a second continuous quenching and tempering line in the 160 in. plate mill at its Homestead District Works, Munhall, Pa. It's designed to meet growing civilian and military demands for heat treated steel plates.

With that and other installations in the 160 in. and 100 in. mills and the Forge Div., the Homestead District Works can treat carbon, alloy, and stainless plates 1/10 to 6 in. thick (and heavier), as well as such forged steel products as generator rotors.

• **Wide Size Range**—The new line is almost identical to the original hardening-quenching-tempering facility which was placed in operation during 1957. Each line is designed to produce quenched and tempered plates in finished sizes up to 2 in. thick, 147 in. wide, and 42 ft long.

For plates too thick to be treated on the continuous lines, the works operates direct-top-fired, car bottom furnaces in its Forge Div. In normal operation, plates up to 6 in. thick are treated in these furnaces; still heavier, special order plates can also be treated.

Forged and machined steel shafting is treated in two batteries of vertical furnaces, also operated by the Forge Div. The furnaces can treat forgings up to 5 ft in diameter and 30 ft in length. The installation is served by quench towers that provide a variety of quench media.

Used almost exclusively as armor for Naval vessels and military hardware until a few years ago, heat treated carbon and alloy plates are being utilized in structures, pressure vessels, mining equipment, applications in highway construction and the petroleum industry, railroad equipment, trucks, and many other fabricated steel products. Design engineers have been able to realize weight and cost savings while maintaining quality through reduced material requirements by using heat treated plates instead of conventional types.

Clevite Ups Foil Capacity

Clevite Corp., Cleveland, is doubling its capacity for the production of electrolytic copper foil, used widely in the electronics industry for printed circuits. The expansion is scheduled for completion in October. The copper foil operation is housed in the firm's McConnelsville, Ohio, plant, along with facilities for the production of high precision, aircraft bearings.

Vermont American Formed

American Saw & Tool Co., Louisville, formed a new corporation, Vermont American, which will serve as the parent firm of American Saw and its divisions: Vermont Tap & Die Co., Multi-Metals Inc., Deluxe Saw & Tool Co., Vermont-Pacific, and Threadit. Lee B. Thomas is president and chairman of Vermont American.

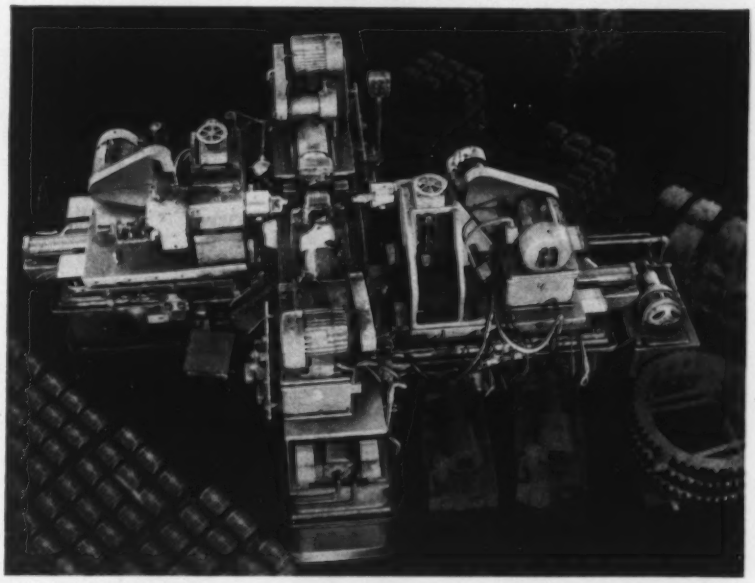
Hanna Enters New Field

Hanna Mining Co., Cleveland, has completed acquisition of a nickel smelter at Riddle, Oreg., and has started commercial production and marketing of nickel. Through a subsidiary, Hanna Nickel Smelting Co., Hanna Mining has operated the plant since it was opened in 1955. To date, it has produced more than 100 million lb of nickel, all for the government.

Hanna Mining has sales agreements with major alloy steel producers. "We are confident that the demand for alloy steels in this country will continue to grow," says W. A. Marting, president, "and that our nickel business will benefit accordingly."

The company will distribute the nickel to steel companies and found-

(*Please turn to Page* 105)



This pays off years from now!

Long life and low maintenance costs in a speed reducer are direct results of original accuracy and quality. Cone-Drive speed reducer housings are machined on this special 4-way boring machine to "tenths", assuring exact alignment of the **double-enveloping worm** and gear used.

Accurate Cone-Drive gearing is available in gearsets, speed reducers and gearmotors.

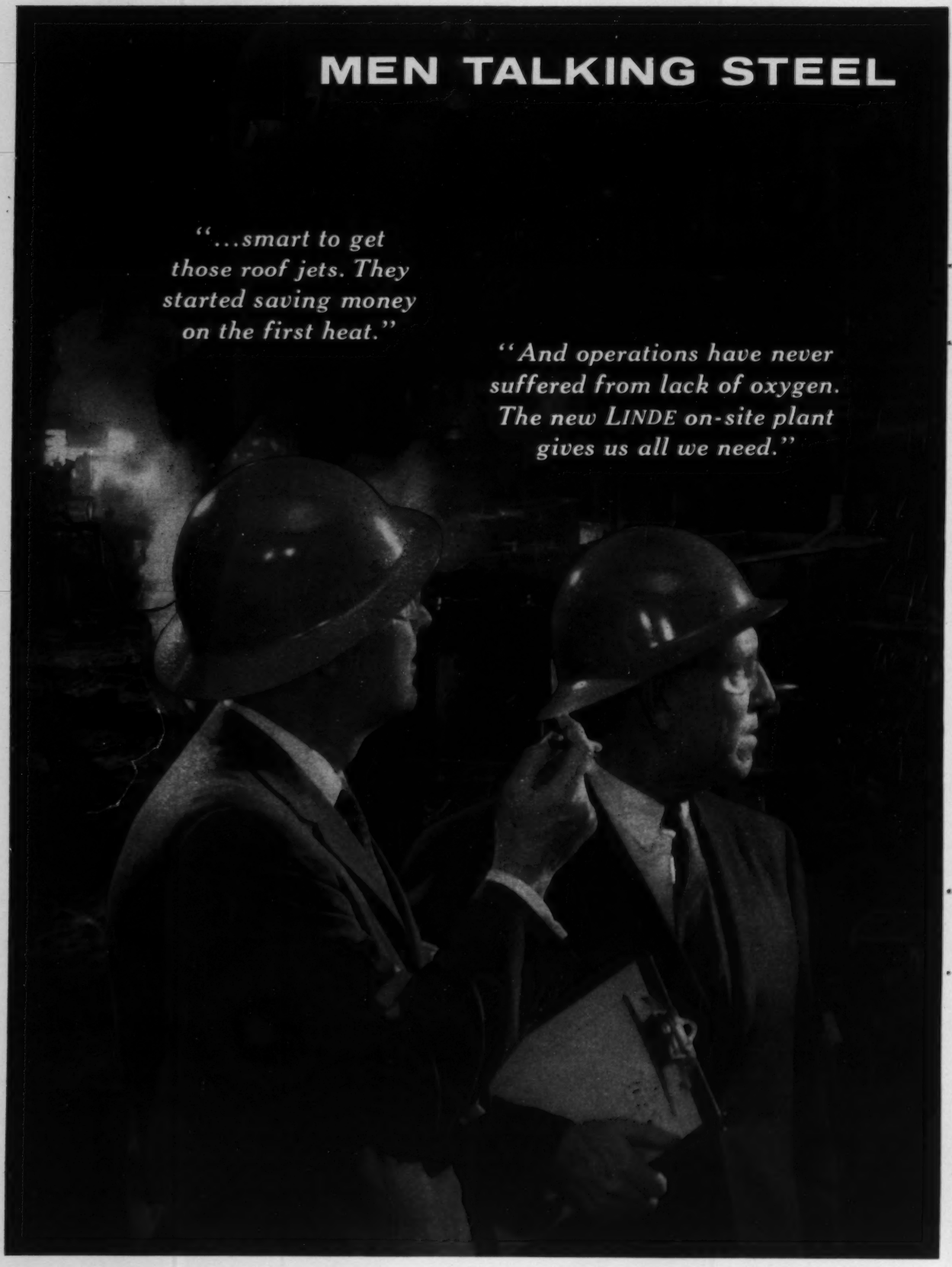
CONE-DRIVE GEARS

DIVISION MICHIGAN TOOL CO.
7171 E. McNichols Rd., Detroit 12

MEN TALKING STEEL

"...smart to get those roof jets. They started saving money on the first heat."

"And operations have never suffered from lack of oxygen. The new LINDE on-site plant gives us all we need."



ARE TALKING LINDE OXYGEN

It takes LINDE to apply "*total gas technology*" to steelmaking, and you can get the facts that prove it by writing Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

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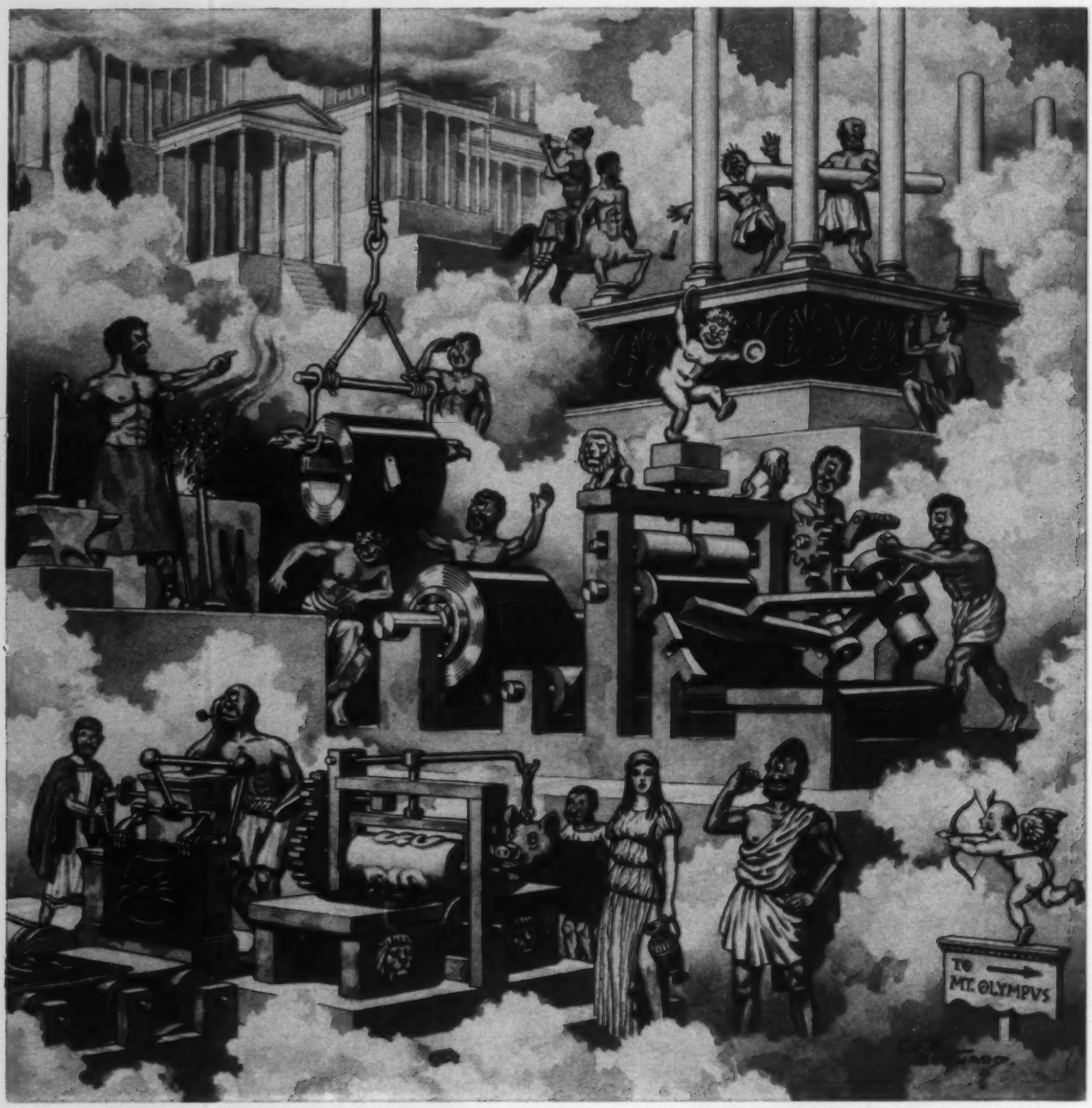
Paradise rebuilt

Venus, obviously, had more than love in mind when she importuned Vulcan to accompany her back to Mt. Olympus and set himself up as the architect of that heavenly realm.

Vulcan, the first metallurgist, knew the rarified air and the cosmic disturbances of the upper regions made a shambles of ordinary building metals. Upon arriving with his corps of Cyclopes, one of his first official acts was to put in a supply of Washington Steel's ColorRold stainless and proceed to erect a permanent haven for his mythological playmates.



There is no substitute for stainless steel whether you are building a skyscraper, a space vehicle or a kitchen sink. Washington Steel's ColorRold stainless enables you to enhance the beauty of your quality product. *It's a better product if it's made of stainless steel.*

WASHINGTON STEEL CORPORATION

PRODUCERS OF *MicroRold* and *ColorRold* STAINLESS SHEET & STRIP

WASHINGTON, PA.

TO FABRICATE STAINLESS WELD IT WITH AIRCO-MATIC

AIRCOMATIC® welding is the lower cost way to fabricate. Weldments show excellent ductility, tensile, and impact properties. Tailored to the process, Airco's wide range of Aircomatic stainless wires can be used for welding all standard alloy types. Remember: Only Airco makes everything you need for stainless welding.

AIRCO AIR REDUCTION SALES COMPANY

A Division of Air Reduction Company, Incorporated, 150 East 42nd Street, New York 17, N. Y. • On the west coast — Air Reduction Pacific Company • Internationally — Airco Company International • In Canada — Air Reduction Canada Limited • All divisions or subsidiaries of Air Reduction Company, Inc.

QUANTITY PRODUCTION OF GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866
THE WHELAND COMPANY
CHATTANOOGA 2, TENN.

(*Concluded from Page* 101)

ries from warehouse stocks in Chicago, Detroit, Pittsburgh, and Riddle.

Ferrochrome Plant Opens

Production of ferrochrome via the Strategic-Udy process will begin at the Niagara Falls, Ont., plant of Strategic Materials Corp. in June. The equipment is now being used to make pig iron from iron ore in a shakedown run. The plant adds 17,000 tons of ferroalloy capacity to the firm's facilities.

This is a joint venture of Strategic Materials Corp. and Universal-Cyclops Steel Corp., Bridgeville, Pa. (STEEL, Aug. 1, 1960, p. 78). The ferrochrome output of the Ontario plant will be purchased by Universal-Cyclops.

Wheeling Plans Expansion

Wheeling Steel Corp., Wheeling, W. Va., plans to spend about $18 million this year for plant additions and improvements. That would be a 50 per cent increase over 1960 capital expenditures. W. A. Steele, president, says: "Management is weighing the advisability of increasing and modernizing steelmaking capacity, adding major finishing facilities, and developing a wider product mix."

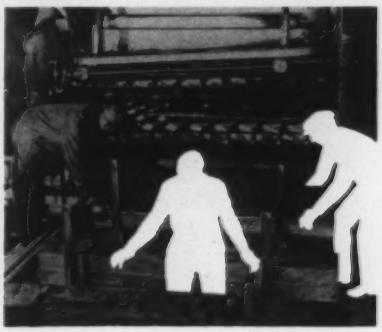
Pipe Plant Opens in June

Standard Pipeprotection Inc. expects to make the first shipment of plastic coated pipe from its new plant at Alton, Ill., in June. The plant will use X-Tru-Coat in its processing, through a franchise obtained from Republic Steel Corp., Cleveland. It will initially handle up to 4 in. diameters. "The plant may be expanded for larger pipe sizes," says H. W. Baird, president. The company uses conventional tar coatings at its St. Louis plant, which handles pipe up to 24 in. in diameter.

Dixie Tool Enlarges Plant

Dixie Tool Industries Inc., Bridgeport, Mich., is erecting additions to its plant which will increase its manufacturing facilities by more than 50 per cent. The firm supplies carbide cutting and routing

USING FRIED EQUIPMENT



1 man does the work of 3!

CUTS AND STACKS 40% MORE SHEET METAL THAN A SHEAR OPERATOR WORKING WITH 2 HELPERS

A. R. PURDY CO., metal warehouse, found their operator, working with 2 back-of-shear assistants, could not keep pace with their shear's 60-strokes-a-minute output. Then they installed a FRIED Liftveyor and Stripveyor . . .

"Production increased to the shear maximum," says a Purdy official. "Equally important, the cost of 2 helpers on each of 3 shears was eliminated!"

Other advantages of the FRIED Liftveyor:

1. Pneumatically operated plungers support all types of metals, all sheet and plate widths, against flexing.
2. Shearing is kept accurate to within .005".
3. Downtime caused by accumulations behind the shear is eliminated.
4. Injuries from sharp-edged cuttings, burrs, falling trim pieces and the like are prevented.

Discover how FRIED plate, sheet and strip handling equipment can help your production and cut your operating costs. For free illustrated catalog, *act now.*

FRIED STEEL EQUIPMENT MFG. CORP.
528 East 119th St., N. Y. C. 35 S-41

Please send me free illustrated material containing full information on your automatic sheet, plate and strip handling equipment.

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LET THIS MAN HELP YOU DECIDE!

Walter R. Jaeschke (Jas'ke) is a Whiting consulting metallurgical engineer and an international consultant on foundry cupola problems. His recommendations have slashed melting costs in Europe, South America, South Africa and Japan, as well as for scores of U.S. firms. An authority on water-cooled cupolas, he consulted extensively on the world's largest—built by Whiting for Acme Steel.

If you are seriously debating the merits of liningless, water-cooled cupolas, why not draw on the wealth of this man's experience? He knows intimately the conditions required to make water-cooled cupolas profitable. He also recognizes those circumstances which make them impractical or uneconomical.

Walter Jaeschke is available—without charge or obligation—to survey *your* needs at your convenience. Whatever his recommendations, they will be based on the dollars-and-cents requirements of your particular operation.

FREE: Bulletin FY-176, *Water-Cooled Cupolas.* Write Whiting Corporation, 15643 Lathrop Avenue, Harvey, Illinois. In Canada: Whiting Corporation (Canada) Ltd., 350 Alexander Street, Welland, Ontario, Canada.

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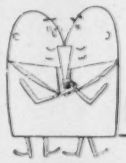
MANUFACTURERS OF CRANES; TRAMBEAM® HANDLING SYSTEMS; PRESSUREGRIP; TRACKMOBILES; FOUNDRY, RAILROAD, AND SWENSON CHEMICAL EQUIPMENT

FOUNDRY EQUIPMENT

tools. A new, automatic, fluting equipment line will be installed.



CONSOLIDATIONS

Textile Machine Works, Reading, Pa., acquired **J. L. Ferguson Co.,** Joliet, Ill., producer of case loaders, sealers, and other packaging machinery. Textile makes hosiery machines and other textile equipment and is diversifying into new product and market fields.

Shinn Industries Inc., Santa Ana, Calif., acquired **Shinn Engineering Inc.** and **Universal Ecsco Inc.,** Downey, Calif. Shinn Engineering is a fabricator of aircraft and missile components. Universal designs, builds, and installs integrated electromechanical, semiautomatic, control process and handling systems.

NEW OFFICES

Laclede Steel Co., St. Louis, opened a branch sales office at 1745 Rand Tower Bldg., Minneapolis, Minn. Lawrence E. Johnson is manager.

Ex-Cell-O Corp., Detroit, established Ex-Cell-O Machinery Sales, 12200 S. Bellflower Blvd., Downey, Calif. Howard H. Schrock is district manager.

ASSOCIATIONS

National Screw Machine Products Association, Cleveland, elected these officers: President, H. G. Smith, Curtis Screw Co., Buffalo; vice president, S. H. Balderson, Davis & Hemphill, Elkridge, Md.; treasurer, H. E. Wheeler, Mitchel & Scott Machine Co., Indianapolis.

National Association of Architectural Metal Manufacturers, Chicago, re-elected J. M. Roehm, Kawneer Co., Niles, Mich., president. Vice presidents are: K. F. Jorss Jr., A. F. Jorss Iron Works Inc., Arlington, Va.; Mitchel Stern, Camden Iron Works, Camden, N. J.; F. M.

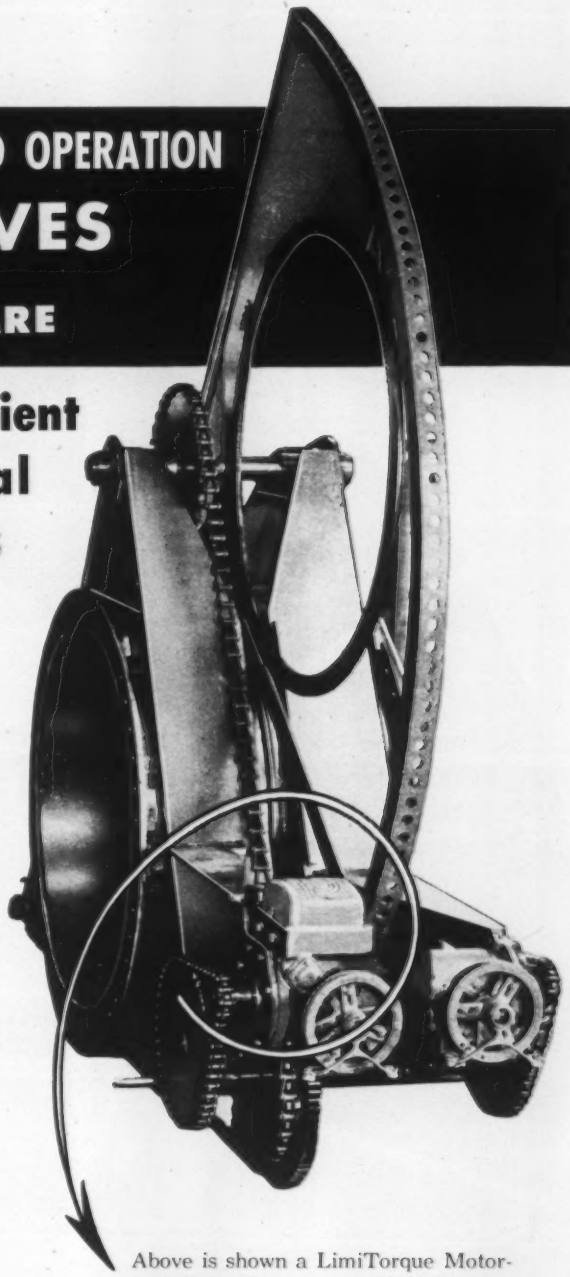
(*Please turn to Page* 110)

Push-Button MOTORIZED OPERATION *of* GOGGLE VALVES BY LimiTorque ARE

Faster, Safer, more Convenient and far more Economical than hand operated valves

LimiTorque Motorized Valve Operators on large Goggle Valves have proven of true value in many steel plants because of their quick, safe and positive cut-off of Blast Furnace, Coke Oven and other types of gases. The use of LimiTorque Operators also easily takes care of Goggle Valves in inaccessible locations; reduces exposure of operating personnel to toxic gases. Another point, operation of Goggle Valves with LimiTorque permits actuation by chain wheel, should there be a power failure at any time.

Write for Bulletin #1-60, which gives full details for LimiTorque Operation of Goggle Valves . . . use your Business Letterhead when requesting a copy.



Above is shown a LimiTorque Motorized Valve Operator on 60" full opening Brosius-Westling Goggle Valve recently installed in a Blast Furnace Gas Main, at a large Mid-Western Steel Plant.

THERE IS NO SUBSTITUTE FOR —

LimiTorque®

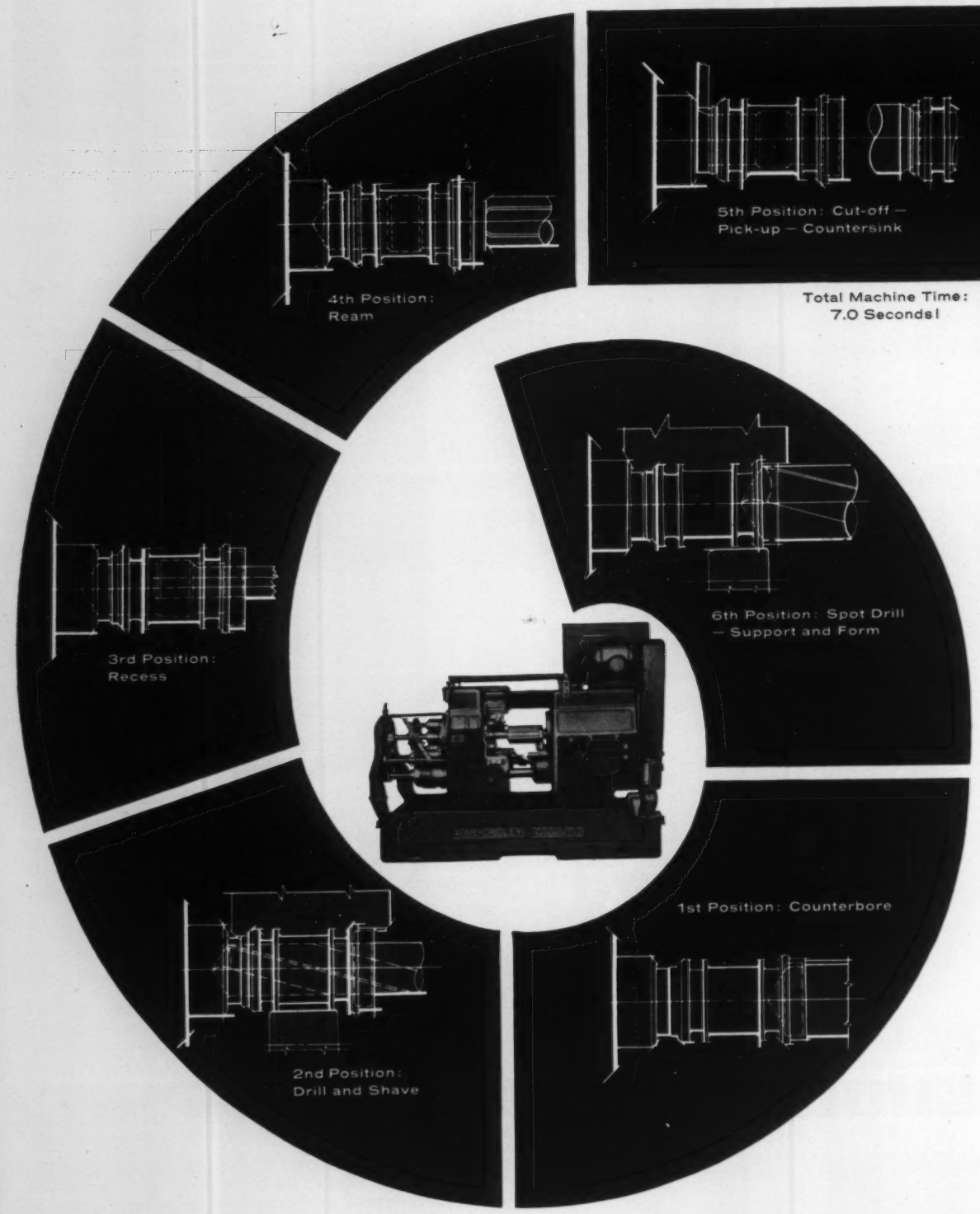
PHILADELPHIA GEAR CORPORATION

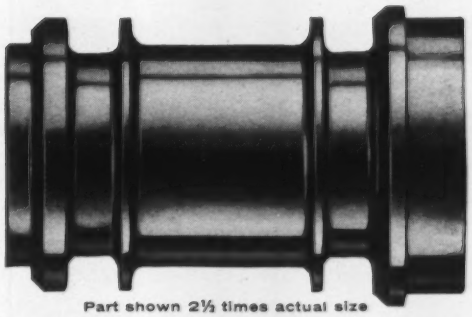
KING OF PRUSSIA (SUBURBAN PHILADELPHIA), PA

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • King of Prussia, Penna.


4th Position:
Ream
5th Position: Cut-off —
Pick-up — Countersink
Total Machine Time:
7.0 Seconds!
6th Position: Spot Drill
— Support and Form
3rd Position:
Recess
1st Position: Counterbore
2nd Position:
Drill and Shave



Part shown 2½ times actual size

"EVEN WE WERE SURPRISED WHEN THE ACME-GRIDLEY DOUBLED OUR PRODUCTION

We'd refigured our set up for bushing blank production and were convinced that the Acme-Gridley would produce greater results than our current automatic machine set up. But, when we *doubled* production and wiped out a 7% reject rate to boot, we were amazed!"

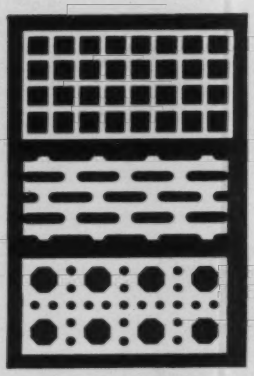
Here at National Acme, we hear a lot of statements like this one made by Ness, Inc., up in Rochester, N. Y. They're one of the country's top product shops and tell us Acme-Gridleys have a lot to do with their success. Just about anybody who has to produce large amounts of an identical precision part will tell you the same thing.

The number of *different* jobs that can be set up on an Acme-Gridley amazes everyone. To give you some idea, we've described some 57 actual jobs in a new 64 page bulletin called "Circumferential Automation at Work". For your free copy, call, write or wire.

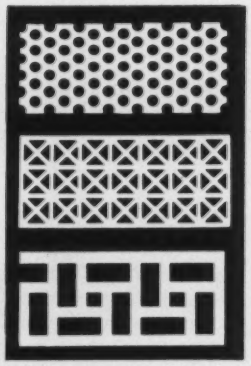
National Acme

The National Acme Company
189 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.



THE
MONEY-SAVING
ANSWER
to
Many Production Problems

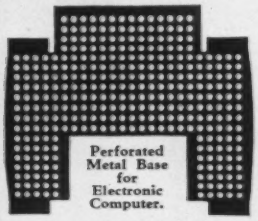


DIAMOND PERFORATED METAL

Sheets • Plates • Panels • Fabricated Parts

For nearly half a century we have supplied America's largest industrial organizations with perforated metal products of all kinds; in lots to meet their production schedules. This procedure not only reduces their inventory costs but, usually, also assures other substantial savings because of our special facilities for producing this type of work efficiently and economically.

Send us YOUR blue prints and specifications. Our experienced engineers are often able to make cost-cutting suggestions without charge or obligation.



Perforated Metal Base for Electronic Computer.

We fabricate special panels or parts to any desired extent. Illustrated Catalog on request.

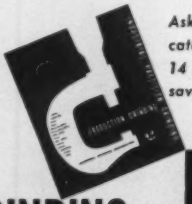
DIAMOND MANUFACTURING CO., WYOMING (Wilkes-Barre Area) **PENNA.**

. . . aiming for lower precision shafting costs?

LET UNIVERSAL SUPPLY AND GRIND IT

Eliminate double purchasing and re-handling bar stock for precision finished straight shafting. Universal's quote on stock and finish will delight you . . . and there's no delay.

Materials — Mild Steel, Alloys, Non-Ferrous.
Finish — To 5-micron.



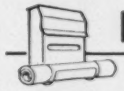
Ask for Universal's illustrated catalog file covering 14 grinding operations that can save you time and money.

UNIVERSAL GRINDING
CORPORATION
2200 Scranton Rd., Cleveland 13, Ohio

(*Concluded from Page* 106)

Knight, H. W. Knight & Son Inc., Seneca Falls, N. Y.; G. H. Smith, Albro Metal Products Corp., New York; and R. E. Nelson, Kawneer Co. R. J. Lyons, Bilco Co., New Haven, Conn., was elected secretary; D. F. Harkins, Nelson-Harkins Industries, Chicago, treasurer.

Marjorie R. Hyslop was appointed manager of the Documentation Service, **American Society for Metals**, Metals Park (Novelty), Ohio. Allan Ray Putnam is managing director of the society.



NEW ADDRESSES

Press Automation Systems Inc. moved into a 25,000 sq ft plant at 3840 E. Outer Dr., Detroit 34, Mich. The firm makes automation equipment for metalworking pressrooms and stamping plants.

Sciaky Bros. Inc. is moving its Research Div. from Los Angeles to its recently enlarged plant at 4915 W. 67th St., Chicago 38, Ill. The company makes electric resistance welding machines.

Bendix Corp., Detroit, moved its New York executive offices to the Time & Life Bldg., 111 W. 50th St., New York 20, N. Y.

Handy & Harman moved its executive offices to 850 Third Ave., New York, N. Y. The firm is a fabricator and refiner of precious metals.

Gordon-Burke Steel Co. moved its plant and office to larger quarters at 2100 Greenwood St., Evanston, Ill.

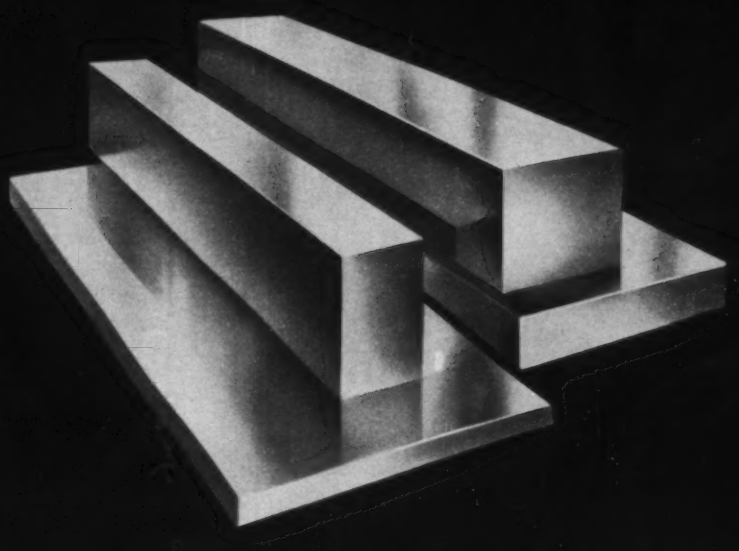
Labelon Tape Co., a division of Labelon Corp., transferred its manufacturing facilities and headquarters to 10 Chapin St., Canandaigua, N. Y.

Hills-McCanna Co. is moving its executive and general offices to its manufacturing plant at 400 Maple Ave., Carpentersville, Ill. The firm makes ball valves, diaphragm valves, proportioning pumps, and automatic lubricators at that plant. The Chicago area field sales personnel and the sales and adminis-

ANNOUNCING

THE CREAM OF PERFORMANCE

IN PRECISION GROUND STEELS



Ohio Die

Precision Ground—high carbon, high chromium die steel

The wedding of OHIO DIE and the advantages of Precision Ground steel brings to every toolroom new convenience—new utility—new economy in the employment of one of America's great die steels.

This favorite high carbon, high chromium steel is now available precision ground to a finish of 30 micro-inches or better; sides flat and parallel; corners true and square. Each piece is packaged individually in a rust-preventive envelope, plainly marked for size and with clear heat-treating instructions.

OHIO DIE is stocked in a wide range of sizes in all our district warehouses. Call for prompt delivery!

FIRST QUALITY • TOOL & SPECIAL STEELS • VA

VANADIUM-ALLOYS STEEL COMPANY

GENERAL OFFICES: LATROBE, PA.

DIVISIONS: Anchor Drawn Steel Co. • Colonial Steel Co. • Metal Forming Corporation • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Co.

SUBSIDIARIES: Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni • EUROPEAN ASSOCIATES: Societe Commentryenne Des Aciers Fins Vanadium-Alloys (France) • Nazionale Cogne Societa Italiana (Italy)

For Better Doors, EVERYTHING POINTS To Kinnear...

For the extra advantages of coiling, interlocking-steel-slat action **(originated by Kinnear)** —and ...

... for doors that open **completely** out of the way ...

... for efficient doors that offer even greater convenience when **power-operated** ...

... for all-metal protection against wind, weather, intrusion and vandalism ...

... for doors that permit full use of surrounding **floor, wall, and ceiling** space at all times ...

... for doors that often deliver 30, 40 — **even 50 or more** years of low-cost service ...

... for heavily galvanized doors that give many **extra** years of corrosion-free service ...

Kinnear Metal Rolling Doors

—and for exclusive REGISTERED doors for which all parts are always replaceable from master details kept in fireproof vaults, insist on —

The KINNEAR Mfg. Co.

FACTORIES:

1780-1800 Fields Ave., Columbus 16, Ohio

1742 Yosemite Ave., San Francisco 24, Calif.

Offices and Agents in All Principal Cities

KINNEAR ROLLING DOORS

Saving Ways in Doorways

trative staffs of the Foundry Div. have moved to 2950 N. Oakley Ave., Chicago, where the firm operates a light alloy casting foundry.

Frederic B. Stevens Inc., Detroit, moved its branch plant and warehouse to 597 Northland Ave., Buffalo, N. Y.

NEW PLANTS

Harbison-Walker Refractories Co., Pittsburgh, is building a rotary kiln plant at Eufaula, Ala., for the calcining of bauxite and kaolin clays used in the manufacture of refractory bricks. The rotary kiln is 200 ft long. The plant is scheduled to go into operation this summer.

Bradshaw Steel & Forge Co. will construct a plant in Pinson Valley, northeast of Birmingham, to manufacture steel forgings for use in the pressure pipe, chemical process, and oil industries. The plant will contain more than 25,000 sq ft of floor space.

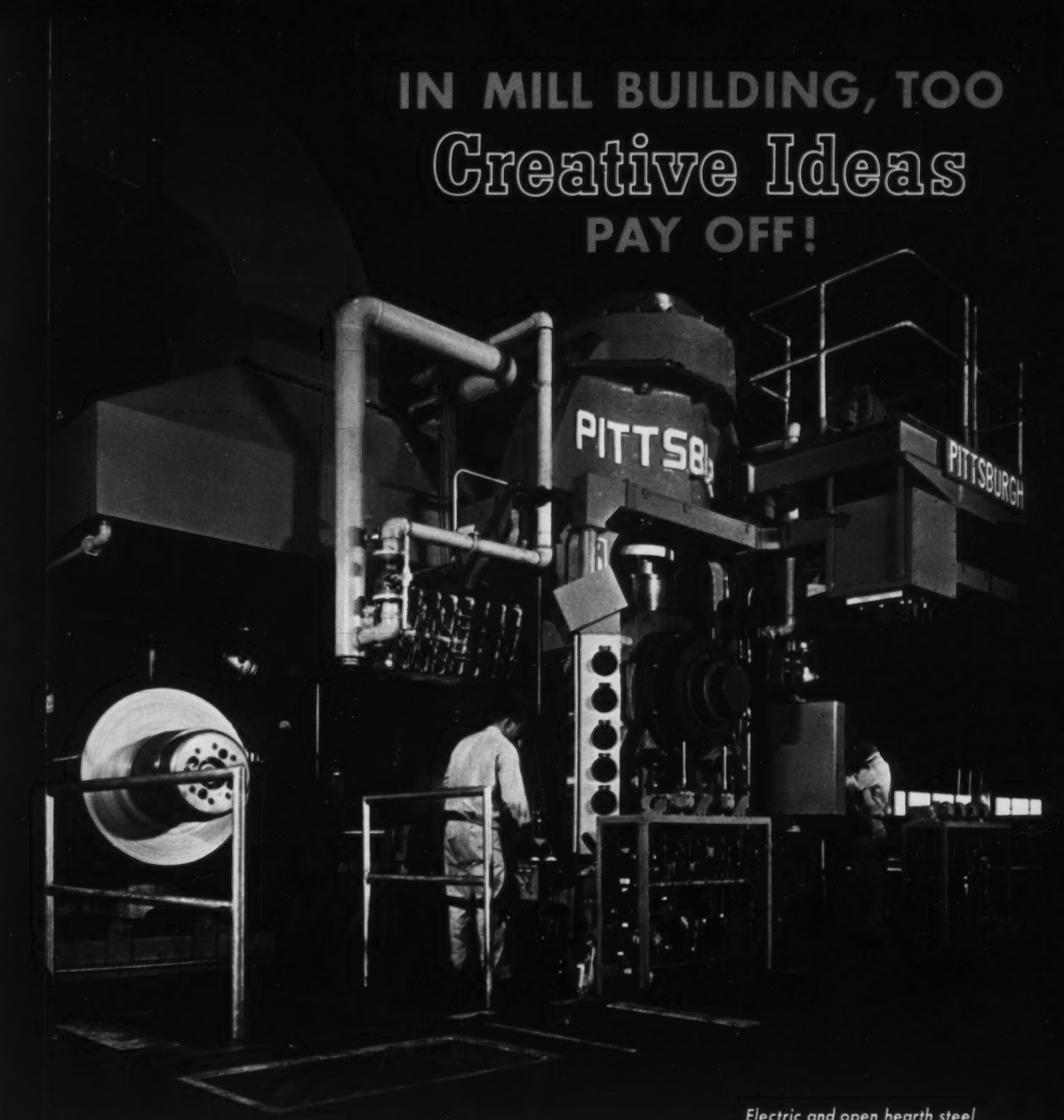
Dodge Wire Corp., Covington, Ga., opened warehouses at 1340 E. Sixth St., Los Angeles, Calif., and at 303 Chestnut St., Philadelphia, Pa. The company produces aluminum insect screening. Fred Wallin heads the office at Los Angeles; Dave Rudolph, at Philadelphia.

C. M. Kemp Mfg. Co., Baltimore, is building a 41,000 sq ft plant and office at Ferndale, Anne Arundel County, Maryland. The firm is a designer and engineer of industrial heating equipment.

S. K. Wellman Co., Bedford, Ohio, on June 1 will move its San Francisco branch warehouse and distribution facilities to a new 21,000 sq ft building at 508 S. Airport Blvd., South San Francisco, Calif. The firm makes all-metal brake linings, brake blocks, clutch plates, and facings.

Ace Fastener Corp. will move June 1 to a larger plant at 4100 Victoria Ave., Chicago. The firm, a subsidiary of Swingline Inc., Long Island City, N. Y., makes stapling equipment.

IN MILL BUILDING, TOO
Creative Ideas
PAY OFF!



Electric and open hearth steel castings from 1 lb. to 100 tons

PITTSBURGH
ENGINEERING & MACHINE DIVISION
pittsburgh steel foundry • a textron company

564 FORBES AVE., PITTSBURGH 19, PA. • PLANTS AT GLASSPORT AND McKEESPORT, PA.

Now...a complete M&T plating "package" offers single responsibility for quality bright plating

It's now M&T all the way with a complete line of processes and supplies for copper, nickel, chromium plating. It's the same technical service man who now takes the trouble to keep trouble out of the whole bright plating operation.

More than this, each M&T process in the package brings genuine operating advantages. Each contributes to a quality finish. Related supplies are of the highest possible quality, backed by all of the know-how accumulated by M&T in over 50 years of serving the plating industry.

M&T offers several different types of copper plating materials to meet any plating requirement. Nickel plating materials include the finest type of anodes — produced by INCO, which appointed M&T an authorized distributor. In chromium plating, M&T's SRHS* Chromium Plating Compounds have no equal for speed and quality, especially for plating the thicker, more corrosion resistant chromium being specified today. They make up baths that are up to 80% faster than the ordinary chromium plating bath, and which control themselves automatically.

By any value analysis, there's dollar value in M&T's long experience in this field. Put it to work for you; let it help your company cut bright finishing costs, reduce trouble and rejects. It's part of the "package" — it costs you nothing. An M&T Plating Engineer will be glad to provide details.

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METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey
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For the Metalworking Manager Who Wants to Plan Ahead

Refractory Metals Emerging As Structural Materials

(Fifth Trends in Metals Study by STEEL)

TUNGSTEN
RHENIUM
OSMIUM
TANTALUM
MOLYBDENUM
IRIDIUM
COLUMBIUM
RUTHENIUM
HAFNIUM
RHODIUM
VANADIUM
CHROMIUM
PLATINUM
PALLADIUM

MOLYBDENUM is the structural material in critical, "hot" areas of the Polaris . . . and the anode in batteries for electric watches.

TUNGSTEN will serve a similar vital purpose in the Minuteman . . . and it's the filament material in your household light bulbs.

COLUMBIUM is being considered (along with molybdenum) for the leading edges of the Dyna-Soar, a vehicle designed to take a U. S. spaceman beyond the earth's atmosphere and bring him back safely . . . and it's used in the chemical industry for its corrosion resistance.

As diverse as these applications are, the materials have one thing in common. They are refractory metals, members of an exclusive, 14-metal club. (Rest of the roster: Tantalum, vanadium, chromium, hafnium, rhenium and the platinum metals—platinum, palladium, rhodium, ruthenium, iridium, and osmium.)

Their unique qualifications include: Higher melting points than any other metals, good corrosion and erosion resistance, excellent strengths at high temperatures, and high densities. Most of them have good nuclear properties. Some have excellent characteristics at room or cryogenic temperatures.

Metalworking's stake in these special metals is substantial because:

1. Technology is moving us into higher temperatures—ranges that cannot be handled by today's sophisticated superalloys.

2. We are going to higher speeds and tougher conditions—not only in spacecraft, planes, cars, and boats, but also in manufacturing operations.

3. To get higher efficiencies in heat engines, we'll need to use higher input temperatures. This means that usage of refractory metals will climb sharply.

Those developments also help to explain the new interest in refractory metals. The materials have been around for years. Molybdenum, tantalum, and tungsten have been used since the early 1900s in electrical applications. They are also well known as alloys in steelmaking. So are vanadium, chromium, and columbium.

The emergence of refractory metals as structurals was brought about by the requirements of "super" temperatures in missile, space, and nu-

clear energy applications.

Most of the advance work and much of the research today are being sponsored by the government.

- **Status Report**—Molybdenum, tantalum and tungsten have histories as structural materials. But it's virtually a new role for vanadium, chromium and columbium.

In fact, we have surprisingly little information about the 14 metals, considering the number of years we've known about them. Yet to be solved are such problems as: Room temperature brittleness; fair to poor ductility and workability; and with the exceptions of chromium and

WHO'S WHO IN REFRACTORY METALS

Primary Producers

	Tungsten	Molybdenum	Tantalum	Columbium	Chromium	Vanadium	Hafnium	Platinum	Palladium	Osmium	Ruthenium	Rhodium	Iridium	Rhenium
ANACONDA CO., New York								X	X					
BISHOP, J., & CO., Malvern, Pa.								X	X	X	X	X	X	
CARBORUNDUM METALS CO., Akron, N. Y., Div. Carborundum Co.							X							
CHASE BRASS & COPPER CO., Waterbury, Conn.														X
CLEVELAND TUNGSTEN INC., Cleveland, sub. Molybdenum Corp. of America	X													
CLIMAX MOLYBDENUM CO. OF MICHIGAN INC., Detroit, div. American Metal Climax		X												
DU PONT DE NEMOURS & CO. INC., E. I., Wilmington, Del.				X										
ELMET DIV., Lewiston, Maine, North American Philips Co. Inc.	X	X												
ENGELHARD INDUSTRIES INC., Newark, N. J.								X	X	X	X	X	X	
FANSTEEL METALLURGICAL CORP., North Chicago, Ill.	X	X	X	X										
FIRTH STERLING INC., Pittsburgh	X													
FOOTE MINERAL CO., Philadelphia							X							
GENERAL ELECTRIC CO., Schenectady, N. Y.	X	X		X										
GOLDSMITH BROS., Chicago, div. National Lead Co.								X	X	X	X	X	X	
INTERNATIONAL NICKEL CO., New York								X	X		X	X	X	
JOHNSON-MATTHEY & CO. LTD., London								X	X	X	X	X	X	
KAWECKI CHEMICAL CO. INC., New York			X	X										
KENNAMETAL INC., Latrobe, Pa.	X		X	X										
METALS & CONTROLS DIV., Attleboro, Mass., Texas Instruments Inc.								X						
METALS & RESIDUES INC., Springfield, N. J.	X	X												
MOLYBDENUM CORP. OF AMERICA, Pittsburgh		X												
NATIONAL RESEARCH CORP., METALS DIV., Cambridge, Mass.			X											
OREGON METALLURGICAL CORP., Albany, Oreg.	X	X				X								
PHELPS DODGE CORP., New York								X	X					
REACTIVE METALS INC., Niles, Ohio			X	X			X							
REDUCTION & REFINING CO., Kenilworth, N. J.	X	X												
SHIELDALLOY CORP., Newfield, N. J.					X									
STAUFFER CHEMICAL CO., METALS DIV., Richmond, Calif.	X	X	X	X										
SYLVANIA ELECTRIC PRODUCTS INC., Chemical & Metallurgical Div., Towanda, Pa.	X	X												
TEMESCAL METALLURGICAL CORP., Berkeley, Calif.		X	X	X										
UNION CARBIDE METALS CO., div. of Union Carbide Corp., New York	X		X	X	X	X								
UNIVERSAL-CYCLOPS STEEL CORP., Bridgeville, Pa.	X	X												
UNIVERSITY OF TENNESSEE, Department of Chemistry, Knoxville, Tenn.														X
VANADIUM CORP. OF AMERICA, New York						X								
WAH CHANG CORP., New York	X	X	X	X			X							
WESTINGHOUSE ELECTRIC CORP., Pittsburgh		X												

some of the platinum metals poor oxidation resistance at high temperatures.

There's a lack of uniformity in metals sold by producers—you even run into variations in batches turned out by a single company. Acceptable standards and techniques of measurement and analysis are needed.

Four major problems are sure to pop up in any discussion:

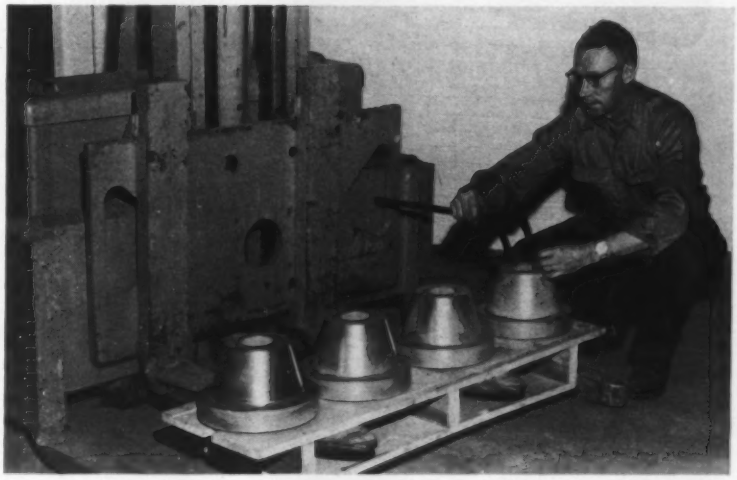
1. Oxidation—At the high temperatures at which we want to employ the refractory metals most of them react with oxygen (and often other gases). The oxides are not protective; they may even be volatile. Unless protection is provided, the metal is destroyed.

2. Transition temperature — The brittleness of most of these metals increases markedly below a given temperature—it's often above room temperature. Under such conditions, forming is extremely difficult.

3. Interstitials—Traces of carbon, oxygen, nitrogen, and hydrogen cause higher hardness and make forming difficult, particularly in the intermediate temperature ranges.

4. Recrystallization — Heating above certain temperatures causes grain growth. Large grains mean a weaker material.

1 Major Structural Metals



TUNGSTEN throat inserts weigh 150 lb each after machining. They are made from pressed and sintered powder. Preforms were produced in isostatic press at Sylvania Electric Products Inc.

• **Over-all View**—Trying to follow developments—as in any new, dynamic field—is a lot like watching a three-ring circus. There is something going on in every part of the arena; other performers are waiting in the wings; and the ringmaster—the U. S. government—is trying to keep all the acts moving.

Understandably, STEEL found little agreement among people in the industry. Even the leaders differ on such basic points as which metals have the best future and what is the best way of producing, shaping, and using them.

Production is still in small runs. Low volume means a lot of hand operations. Most products are custom built.

Such a kaleidoscopic picture does not stand still, but its message is clear. The futures of our aerospace, power generation, and nuclear activities are partially dependent upon developments in refractory metals.

To give you an idea of how much progress has been made and to help you assess the outlook for these metals, the editors present this report.

SOME refractory metals have limited futures (as alloying agents, as coatings, or as minor but important components) because of their properties, or because they are in restricted supply.

Tungsten, molybdenum, columbium, and tantalum have the brightest prospects as structural materials.

Tungsten

Tungsten has the highest melting point (6170° F) of any metal. So it probably has the best high temperature potential.

Interest is being spurred by the high temperature requirements of missiles. Tungsten is being used in the throat of the exhaust nozzle in the Minuteman. It may soon replace molybdenum in the nozzle of the Polaris. It has potential as a structural material in aircraft engines and in the skin and frames of aircraft, missiles, and space vehicles.

"There could be a market for tungsten (and moly) in present day jets (for parts right in the heart of the engine if you could protect them from oxidation)," says R. H. Thielemann, chairman, Metallurgy Department, Stanford Research Institute, Menlo Park, Calif.

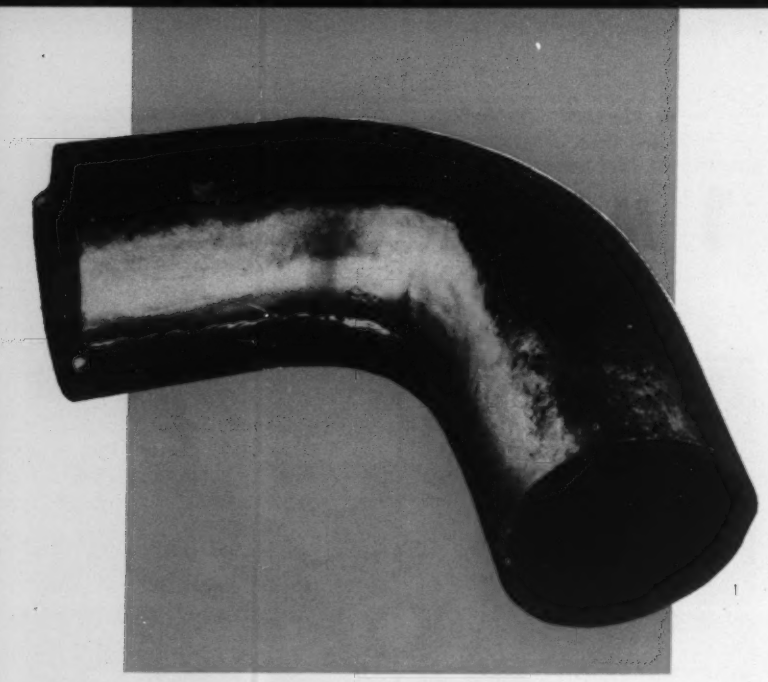
• **Traditional Uses:** Filaments in electric light bulbs, contact points in auto engines, in radio and power tubes, welding rods, points in electric shavers, shielding and heating elements. Its biggest use has been as a steelmaking alloy and in carbides.

Despite our long time history of utilizing tungsten and the amount of research underway, we are still in the Middle Ages when it comes to working, producing, and using it.

Besides its high melting point, tungsten has good strength at high temperatures, good electrical properties, wear and abrasion resistance, shock and corrosion resistance. It can be coated for oxidation protection. It's one of the most inert metals and has a low vapor pressure.

• **Triple Trouble**—The major problems are:

1. At a red heat in air, tungsten



MOLYBDENUM with 0.5 per cent titanium was used for this elbow by Rocketdyne Div., North American Aviation Inc., Canoga Park, Calif. A drop hammer stamped half sections before fusion welding

oxidizes rapidly. Researchers discount the possibility of an oxidation resistant alloy; they say the answer is a coating. But a coating is difficult to come by since there aren't too many materials to choose from if you're going to use the metal at high temperatures and cycle it to room temperature. Until such a coating is developed, use of tungsten at high temperature is limited to protected atmospheres.

2. Tungsten lacks ductility. One of the main projects in refractory metal research at the Bureau of Naval Weapons is to find an alloy with increased room temperature ductility, reports Nathan E. Promisel, chief materials engineer. Alloys containing molybdenum and rhenium seem to hold promise, probably by controlling distribution of interstitials, introduction of a twinning mechanism for deformation, and unlocking of dislocations, says Mr. Promisel. Additions of rhenium may help to control grain size.

3. Tungsten is difficult to fabricate (see Page 127). Dr. James Wong, chief metallurgist for Wah Chang Corp.'s Albany, Oreg., plant, reports his firm has alloyed the metal to reduce the grain size. Some improvement is realized, says Dr. Wong, but the alloy does not have appreciable ductility.

When technical problems are ironed out, tungsten could have a good future in such civilian areas as: High temperature furnaces, vessels, and other "high heat" applications in petrochemicals, blades for gas turbines, and plasma equipment.

● **Demand Up**—Tungsten consumption is on the rise. In 1960 U. S. consumption was 5802 tons, the highest since 1951. Of that total, only 120 tons were sold in metallic form.

The bulk went into carbides and steelmaking—in that order.

Traditionally, the U. S. has been a heavy importer of tungsten. But it doesn't mean we couldn't supply all our current needs.

U. S. reserves are around 71,000 tons (metal content), those of the Free World about 300,000 tons.

● **Prices**—"At today's prices, tungsten is a bargain," comments Mr. Thielemann, Stanford Research Institute. Hydrogen reduced powder sells for $3.00 to $3.90 a pound; sheets made by powder metallurgy cost $9 to $35 a pound (arc-cast sheets are not available).

Molybdenum

From the standpoints of price, domestic availability, alloy development, and general knowledge, molybdenum is the No. 1 refractory metal today. Yet there's no consensus about its future as a high temperature structural material.

The metal has been produced commercially for 51 years, mainly as a steelmaking alloy. However, uses as a metal are many and varied. Some examples: Electronic and electrical applications in lamps, tubes, electric furnaces, contacts, electrodes, transducers, transistors, and rectifiers; extrusion dies; boring bars and grinding spindles; piercer points for making seamless tubing; ladle test molds for samples of molten iron and steel; nuclear energy components; chemical industry equipment such as valves, heat exchangers, reboilers, steam lances, tank liners; glassmaking equipment such as electrodes, stirrers, pumps, bowl liners, wear parts, molds.

● **First in Missiles**—Moly was the first refractory metal to find tonnage application in missiles. However, it's losing some ground now.

Some people believe that the metal may be caught in a squeeze in the space-missile-aircraft field, with tungsten taking the extreme high temperature applications and columbium getting the nod in areas where superalloys leave off.

No one's ready to rule moly out or wave columbium in. In some cases, say weapons people, designers may find that temperature requirements are not as great as originally thought, and they may redesign from tungsten to take advantage of moly's easier workability.

● **Potentials**—The metal has a good outlook in fields it has already penetrated. It also has potentials in: Thermocouples, diecasting cores for aluminum, chemical tubing, piping, tank linings, and heat exchangers. Moly 30-tungsten alloy is one of the few materials that will resist molten zinc. It's being considered for pumps in zinc refineries (one is in operation).

A good potential for moly alloys exists in stationary gas turbines and in chemical and petrochemical process equipment, believes Wah

Chang's Dr. Wong. He adds: "If producers can develop an alloy with a suitable coating that is ductile at lower temperatures, it could be used in jet engines today."

• **Problems**—Moly is more prone to oxidation than any of the other refractory metals. Slow oxidation starts at around 900° F. The metal begins to "smoke" at 1200 to 1300° F. At higher temperatures, the effect is "catastrophic."

A coating that prevents oxidation increases moly's utility. A new one was announced last month by Chromizing Corp., Hawthorne, Calif. (a subsidiary of Chromalloy Corp.). It's said to endure severe thermal shock and erosion to temperatures as high as 3800° F. Chromalloy's president, Richard Seelig, told STEEL the silicon-containing coating gives moly close to 100 hours of life at temperatures of 2700 to 2800° F. "This solves the problem for molybdenum in the Dyna-Soar program," says Mr. Seelig.

(Chromalloy says this is only the start of a series of coatings that will also encompass tungsten, columbium, and their alloys.)

Pfaudler Co., Rochester, N. Y. (a division of Pfaudler-Permutit Inc.), can produce "adequate and more than adequate" coatings for moly (and columbium) for present requirements, says David Priest, assistant research director.

• **Other Troubles**—The metal is harder to fabricate than columbium or tantalum but easier than tungsten. Welding and joining are difficult. The metal should be worked above its transition temperature, where it's ductile.

A promising report: General Electric Co. says it can supply moly sheets that have improved room temperature impact properties and "handle much like cold rolled steel."

The metal has many more plusses than minuses: It can be alloyed to high strength at medium temperatures; has good resistance to certain acids (like sulfuric), liquid metals, and molten zinc; has hot hardness, stiffness, and good thermal conductivity; has a melting point (4730° F) that's exceeded only by tungsten, rhenium, osmium, and tantalum; has high strength at elevated temperatures; has a high modulus of elasticity; has good resistance to corrosion; has fair electrical conductivity (about one-third that of copper); has good neutron absorption characteristics; and has a low vapor pressure (approximately that of carbon).

Why use moly when you can go to tungsten, which has a higher melting point?

Answers R. R. Freeman, manager special development, Climax Molybdenum Co., a division of American Metal Climax Inc.: "Moly is available in a wider range of shapes, from 12 in. diameter billets to 0.0005 in. foil. You can get such products as bolts, rivets, wire, and wire mesh.

"Moly is easier to fabricate. It's less brittle. It's only half as heavy as tungsten."

• **Supplies**—The U. S. is self-sufficient. About 60 per cent of the Free World supply (and more than two-thirds of domestic production) comes from the Climax mine in Lake County, Colo. The remainder of U. S. output is a byproduct of copper mining.

U. S. consumption dropped slightly in 1960 to 31.8 million lb; 829,000 lb were in the form of wire, rods, and sheets, and 1.5 million lb in other structural shapes.

• **Price Trend Down**—Moly powder sells for $3 to $3.50 a pound. Sintered ingot is about $5 a pound; arc melted ingot, $6.50. Forging billets are about $5 a pound in powder metallurgy and about $8 a pound in arc-cast. Moly sheets in sintered form sell for $12 to $30 a pound, arc-cast about $25 to $40.

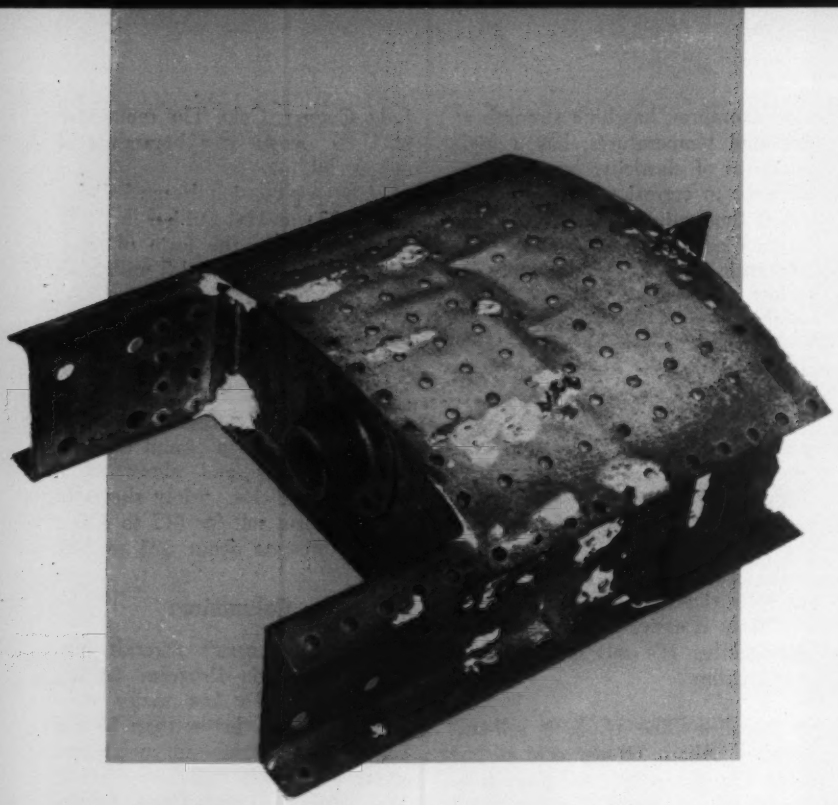
Columbium

The government's Aircraft Nuclear Propulsion Program (ANP) was the metal's first major market. Under it, better than 90 per cent of all columbium metal was going to Pratt & Whitney Aircraft Div., United Aircraft Corp., for development of an indirect cycle nu-

Properties of Refractory Metals

Metal	Melting Point °F	Boiling Point °F	Density g/cc
Tungsten	6,170	12,092	19.3
Rhenium	5,755	10,166	21.0
Osmium	5,432	9,932	22.5
Tantalum	5,425	11,012	16.6
Molybdenum	4,730	8,672	10.2
Iridium	4,427	9,750	22.4
Columbium	4,379	5,972	8.56
Ruthenium	4,082	8,850	12.2
Hafnium	3,587	9,750	13.36
Rhodium	3,560	8,130	12.4
Vanadium	3,450	6,062	6.11
Chromium	3,407	4,476	7.20
Platinum	3,217	6,000	21.45
Palladium	2,826	7,200	12.02

Sources: R. I. Jaffe, Battelle; ASM Handbook, Eighth Edition.



MOLYBDENUM fabricated structure, given a protective coating, is shown after exposure to 2500° F. McDonnell Aircraft Corp. used the part to test structural stability to high temperature and cycling

COLUMBIUM with 1 per cent zirconium makes up this ingot from Wah Chang Corp. It weighs 3000 lb before machining to remove surface imperfections; value is $125,000

clear engine. Last month, President Kennedy canceled the ANP program, a blow to hopes for an early large scale structural market.

Columbium's prospects as a ferroalloy are good. As a structural metal, it should have one of the brightest futures of any of the refractory metals.

• **Why**—Columbium is inherently ductile and retains its room temperature ductility after heating. With the exception of chromium, reserves are the best of any of the refractory metals. Prices have been coming down. The pure metal is easy to fabricate.

Except for tantalum, columbium has the best corrosion resistance of the major refractory metals. It has low neutron absorption, can be joined by welding, has good ductility after welding. Along with tantalum, it can tolerate more impurities without sacrificing quality than any of the other metals in the refractory group.

The metal has a melting point of 4379° F and a density about the same as nickel's.

"On a strength-weight basis, columbium gives the best performance of all metals at temperatures of 2000 to 2500° F," says Dr. Edward Epremian, technical co-ordinator, Union Carbide Metals Co.

The biggest problem: The pure metal and its simple alloys oxidize badly in air at temperatures above the 800° F range.

When columbium oxidizes, it appears to be sound and uniform below the surface scale, but it's not! Here's what happens: Oxygen penetrates the metal, increasing its high temperature strength and brittleness. The result is a decrease in room temperature ductility. Recent alloy development has greatly improved oxidation resistance, but a coating is still necessary at higher temperatures.

• **Another Major Problem:** Sometimes, when you alloy the metal for strength, you lose fabricability and ductility, and when you protect it against oxidation, you don't get the best strength properties. The problem will probably be solved.

McDonnell Aircraft Corp. is working stainless steel to stimulate columbium, says Charles W. Neff, project engineer, Missile Engineering Div. The reasons: At 1000° F stainless has the same expansion characteristics as columbium at 2500° F. It's also a simpler and cheaper way to get answers.

Where high purity columbium can be used, its workability is in a class with that of gold and silver, says Charles d'A. Hunt, vice president of Temescal Metallurgical Corp., Berkeley, Calif. "Ingots can be processed directly into tubing, sheets, rods, and similar forms without difficulty and with little scrap loss."

• **Potentials Great**—The future of columbium and its alloys is brighter in special marine, chemical plant, electronic, and nuclear uses —mainly for its corrosion resist-

ance. Its potential in the nuclear industry centers on the sodium cooled and other liquid metal reactors. Another possibility would be gas cooled reactors. Here oxidation resistance will be of little consequence since helium is the outstanding candidate for coolant. The major criteria will then be strength and neutron economy.

Biggest ultimate potential for the high-temperature, oxidation resistant alloys is in blades for the gas turbine engine, say columbium men.

Other uses will develop, many from "blue sky" ideas. Says one expert: "There's too little known about the basic physical metallurgy of all the refractory metals." States another: "Future applications will involve more complex criteria than simply melting point, alloying behavior, or corrosion resistance. Intelligence, ingenuity, and concerted effort are needed."

● **Possibilities**—Space and missile programs may require some columbium (it's being considered for the Dyna-Soar program). Jet aircraft engines offer another possibility for combustion chambers, turbine blades, and other hot parts.

Rapid alloy development is opening up a host of new possibilities. One example: A columbium, 30 per cent tin alloy developed by Bell Telephone Laboratories that acts as a superconductor at cryogenic temperatures. It can carry average current densities exceeding 150,000 amperes per square centimeter. It may be used wherever high strengths of magnetic fields are required. One possibility: Fusion reactors.

Columbium base alloys with higher elevated temperature strengths are in an advanced state of development at Fansteel Metallurgical Corp., North Chicago, Ill., says R. W. Rawson, general manager.

● **Supplies** — Availability is not a problem. Free World "official" reserves are slightly under 6 million tons (they're probably much greater). Wah Chang recently brought in a Brazilian mine which could take care of Free World demand at the 1960 rate for more than 2000 years—and the full extent of the property isn't known yet.

● **Price to Come Down**—Producers think prices will eventually drop below $5 a pound. Today, the metal is expensive: Columbium powder sells for around $25 a pound; ingot for $40. Mill shapes run $60 a pound and up.

TANTALUM sheathes these bayonet heaters used in chemical processing. Single and triple units are shown. Pfaudler Corp. supplies them where chemical resistance is required

Tantalum

This is the most corrosion resistant of the major refractory metals. It also has the fourth highest melting point (5425° F).

Those two qualities, particularly corrosion resistance, plus good ductility, explain the metal's solid market in electronic capacitors and electron tubes, in acidproof equipment in chemical plants, in surgical instruments and sutures, and in electrical rectifiers for railroad signals and highway protective devices. Its biggest use by far is in capacitors.

● **Supplies**—The metal has one tremendous drawback: It's in relatively limited supply. A fivefold increase in demand would strain world production. Free World reserves are about 106,500 tons, none of which are in the U. S. Brazil is the leader (about 57,500 tons),

followed by Africa (41,000 tons). Tantalum is usually found with columbium, but there's little of it in the vast, new columbium deposits.

Because of tight supply, the price is relatively high (currently, about the same as columbium). Last year, the price of tantalite ore increased about 50 per cent.

• **Future**—Tantalum's main market growth will probably continue to be in the capacitor field and in corrosive resistant chemical applications. Certain specialized missile-aircraft uses are viewed as possibilities. In defense work, tantalum (like tungsten) is not highly competitive in sheet form with lower-density moly and columbium, but reports indicate that tantalum forgings for solid propellent rocket motors are being studied. In leading edge uses below 2500° F, moly and columbium are favored. At higher temperatures, both tantalum and tungsten would probably be more suitable, say defense sources. One advantage tantalum has over tungsten: It's more fabricable.

2 Minor Structural Metals

HAFNIUM, vanadium, and chromium are the minor structural metals. Hafnium is the only one that has more than token use in metallic form today.

Hafnium

All hafnium being produced goes to the Atomic Energy Commission.

Most of it winds up as control rods in submarine reactors.

• **Prospects Limited**—Control rod usage of one type or another should go on and on—and that's about the extent of hafnium's future as a structural metal. The reason is supply. No hafnium deposit has ever been found. The metal is obtained solely as a byproduct of zirconium recovery in the ratio of about 2 parts hafnium to 98 parts zirconium. To get hafnium, you have to carry the extraction process as far as a zirconium oxide. Obviously, production is geared to demand for zirconium.

The metal's chief claim to fame is its ability to absorb neutrons.

Hafnium additives may raise the strength of columbium without affecting workability.

The Navy is studying the metal as an addition to tantalum-8 or 10 per cent tungsten. Another alloying potential: As an addition to carbide. (Hafnium carbide has the highest melting point of any known material.)

• **Hard to Get** — Because of the tightness in supply, it's difficult to get hafnium even for alloying research. For the same reason, little has been done in exploring structural uses outside the nuclear field. Even if you could get the metal, its cost is extremely high.

It may find use in fuel rods for atomic powered space vehicles. Minor electronic applications are another possibility.

Hafnium has good aqueous corrosion resistance. It is not difficult to fabricate (perhaps a shade easier than columbium). It forms a scale in air, but it isn't subject to catastrophic oxidation like tungsten and moly. Hafnium's machinability resembles that of 18-8 stainless steel.

In 1960, the U. S. produced 75,000 to 95,000 lb of hafnium sponge.

Vanadium

Two years ago, there was a lot of excitement about vanadium as a structural material. But its outlook has lost some of its luster even among those who have a stake in the metal. Most researchers seem inclined to write the metal off ex-

Where to Go for Help

FABRICATORS of the refractory metals can get help from many sources:

• First, of course, is the supplier (see Page 116).

• Government agencies, particularly the Navy's Bureau of Weapons, the National Aeronautics & Space Administration, and the Air Force, can help if the job is for the government.

• Research institutes may take on programs of investigation; they're usually long range. Among the groups doing such work: Battelle Memorial Institute, Columbus, Ohio; Armour Research Foundation of the Illinois Institute of Technology, Chicago; and Stanford Research Institute, Menlo Park, Calif.

• Publications of the Defense Metals Information Center are useful. Trained scientists have searched the literature, contacted various sources to compile a wealth of material. The center, located at Battelle, collects, interprets, and disseminates information on special metals used for military purposes.

• Metallurgical meetings and publications offer much information—usually highly technical. The Cleveland chapter of the American Institute of Mining, Metallurgical & Petroleum Engineers sponsored a meeting on refractory metals only last month. Another sponsor of such meetings has been the American Society for Metals. And a technical publication devoted to this area, called the *Journal of the Less Common Metals*, is available. (It's published by Elsevier in the Netherlands.) Information given at the technical meetings is often published later in book form.

cept in a few specialized applications.

One exception: The Navy Bureau of Weapons has given Armour Research Foundation a contract to study vanadium alloys. Armour has come up with a vanadium-5 per cent titanium, 20 per cent columbium alloy that has short time tensile strengths of 75,000 psi at 1800° F; 50,000 psi at 2000° F; and 35,000 psi at 2200° F. Because of vanadium's low density, such strengths make it competitive with other refractory metals, says the Navy. Another factor: The alloys can be rolled into sheets. But the Navy adds: "These are short term strengths we are quoting. We don't yet know about long term strengths."

• **Problems** — Resistance to oxidation (and to reducing chemicals) is poor.

As one source puts it: "Columbium crumbles; moly evaporates; vanadium drips away."

Another metallurgist evaluates the metal this way: "It is good in everything but not the best in anything. While it's not a high strength metal, it has a good combination of properties. The trouble is it has no outstanding one."

• **Some Possibilities** — Vanadium provides good liquid metal corrosion protection. Its resistance to aerated salt water attack is better than that of many stainless steels, says the Bureau of Mines. It is resistant to dilute hydrochloric and sulfuric acid. In pure form, it has good room temperature ductility and fabricability. Those properties add up to some potential for structural applications.

Vanadium cold works slowly and has a high capacity for cold deformation. That means it holds up well under the bombardment of neutrons. The outlook for adoption in the fast reactor is fair if you're not too concerned about neutron capture.

Most of the metal currently being produced is going to the Atomic Energy Commission for a classified use.

A recent application: As an interlayer between titanium and carbon steel. Joining is possible, because vanadium is compatible to both. The vanadium is welded to the steel, and the titanium is welded to the vanadium.

The metal's big use has been, and will continue to be, as an alloy in steelmaking.

• **Supplies**—The U. S. is not only self-sufficient. It is a net exporter of vanadium. Consumption increased in 1960 to about 2211 tons—vs. 2080 tons in 1959. Production rose for the third straight year, netting about 5500 tons—vs. around 4090 in 1959.

Increased demand from European steelmakers was the major reason for the gain.

Reliable figures on reserves are not available. The domestic supply comes as a byproduct of uranium. A date to watch: In 1966, the government's uranium buying program ends. After that time, producers will probably have to go to the lower grade, vanadium bearing phosphates and shales for the raw material. It means that producers will have to process low grade ore. A modest price increase could result.

Outside the U. S., only Finland and the Union of South Africa are significant Free World producers.

Chromium

This is the most difficult refractory metal to assess. The consensus: Its future as a structural is not too big. At room temperatures, it has the worst ductility and impact resistance of any of the refractory metals.

Pure chromium is almost impossible to fabricate because of its strain sensitivity.

Chromium's biggest asset is that it is the most oxidation resistant of the structural refractory metals. But at high temperatures a nitride forms on the surface, which makes it brittle.

But the outlook may not be as dark as it seems to be. Two recently developed alloys (one that contains the platinum metals, the other cerium and yttrium) lower chromium's transition temperature.

• **Holds Hopes** — Chromium has

VANADIUM CYLINDER is the largest centrifugal casting of the metal commercially produced, reports Oregon Metallurgical Corp. Diameter of the ring is 14 in., weight is 60 lb

staunch supporters. One is Prof. Nicholas J. Grant, Massachusetts Institute of Technology, who makes these points: "As a future structural material to be used in tonnage quantities, chromium stands out as the No. 1 candidate among the refractory metals. It is by far the most plentiful in supply and therefore offers the greatest possibility for being lowest in price. Next to vanadium, it is also the lightest of the metals and ought to show good strength to weight ratios. Finally, it has natural oxidation resistance.

"Chromium and chromium base alloys ought to show good oxidation resistance up to 2200° F without protective coatings.

"At MIT, we have demonstrated that chromium has exceedingly good oxidation resistance in the range of 1800 to about 2200° F for at least several hundred hours. We, along with others, have indicated that chromium can be cold worked to decrease the transition temperatures for brittle fracture to a degree that makes the material promising for low temperature handling.

"Chromium and its alloys have shown extremely good high strength values at high temperatures, coupled with good ductility. The major drawback at the moment is a relatively high transition temperature for ductile to brittle fracture, but it is hoped this can be minimized through judicious alloying, or through proper cold working treatments."

By adding certain ceramics to chromium, the Bendix Products Div., South Bend, Ind., of Bendix Corp., says it has developed a material (Bendix Chrome-30) that "has shown exceptional resistance to oxidation."

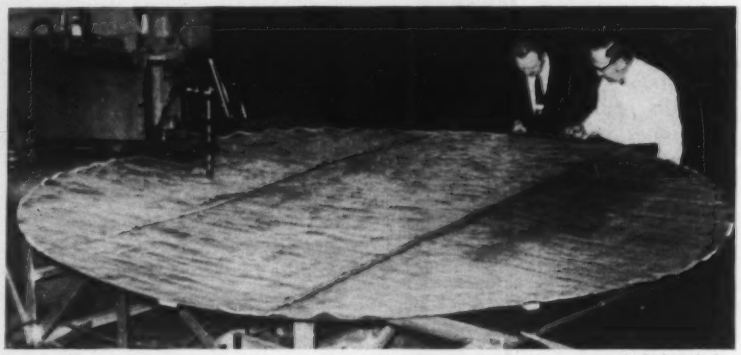
It also has "a degree of ductility not found in pure chromium."

Bendix believes the alloy "should satisfy many requirements for an oxidation resistant, intermediate high temperature material (2200 to 3000° F)."

• **Supplies**—World reserves of commercial grade ores are in the hundreds of millions of tons. The bulk is in Africa, Turkey, and the Philippines.

Chromium metal production in the U. S. is not reported. There are only two producers.

3 Platinum Metals



J. Bishop & Co.

PLATINUM-RHODIUM gauze, nearly 10 ft in diameter, is destined for the oxidation catalysis of ammonia in the production of nitric acid. Other catalytic processes make use of platinum in various forms

THE SIX metals in this group—platinum, palladium, rhodium, ruthenium, iridium, and osmium—have a combination of properties that's hard to beat: High melting points, superior resistance to corrosion and oxidation, chemical inertness. But supply will limit their usage. The world's annual production of the six metals is only about 30 tons.

The metals fall into a trio of pairs: Platinum-palladium, iridium-rhodium, osmium-ruthenium. The first metal of each pair has about twice the atomic weight and density and a higher melting point than its companion.

Platium and palladium are by far the most abundant and most versatile metals in the group. In an average year, platinum accounts for about 60 per cent of production, palladium about 30 per cent.

Despite limited supplies and high prices, usage is growing—as structural components and as a key alloy and coating in highly specialized applications.

Here's how the market shapes up:

• **Platinum** — The pure metal is white, ductile, and has a melting point of 3217° F. It's being applied more and more in combination with the major refractory metals—as a cladding or coating on tantalum, tungsten, and molydenum. For example, a piece of equipment fabricated from moly is coated with a platinum alloy because of the material's high melting point and chemical inertness. If temperature were the only factor here, a cheaper material could be used—but the necessary corrosion resistance could not be obtained without contamination.

A platinum-clad tungsten is being used in electronic components, like grids, where you want to avoid secondary electrical emission. "The future looks bright for platinum as a coating on the major refractory metals," says Engelhard Industries Inc., Newark, N. J.

Refractory uses for pure platinum are growing, again because of the metal's high melting point and chemical inertness. For example, platinum is used for the bushings in equipment that makes glass fibers. A platinum-10 per cent rhodium alloy is used with platinum as a thermocouple in steelmaking.

Another growing market: Rhodium-platinum wound electric furnaces (for heat treating, brazing, specialized alloymaking) in which temperatures range up to about 3200° F.

The glass industry utilizes platinum metal crucibles in melting and

handling molten glass.

Ordinary temperature applications include: Catalysts for the production of high octane gasoline (the largest single use of platinum today), cathodic protection of underparts of boats and ships, dental and medical devices, and jewelry. A growing market: Platinum gauze screen that's used in the production of nitric and hydrocyanic acid.

• **Palladium**—The lightest of the platinum metals also has the lowest melting point (2826° F). Palladium has many applications similar to those of platinum. But by far its biggest use is as a low current electrical contact. (Palladium has more of that market than all other metals combined.) Other uses include: Jewelry, and as a catalyst in the production of chemicals, antibiotics, vitamins.

A diffusion unit for hydrogen purification, says J. Bishop & Co., Malvern, Pa., uses a new palladium alloy.

• **Rhodium**—Pure rhodium, which melts at 3560° F, is much harder than platinum or palladium. It can be wrought, but it is used mainly as an alloy and as an electrodeposited coating on reflectors, projectors, and searchlights; electronic components; and jewelry.

• **Ruthenium** — The pure metal melts at around 4082° F, but its outstanding characteristic is hardness. You'll often find it alloyed with palladium and platinum for that reason. It's also used in fountain pen tips and phonograph needles.

• **Iridium**—Its principal application is as an alloying material, usually as a hardener for platinum. Iridium is the second heaviest of metals and is harder than rhodium. It melts at about 4427° F.

• **Osmium**—This is the heaviest of all the elements (it weighs 0.82 lb per cubic inch). It's hard and unworkable. Chief uses: Tips of fountain pens and phonograph needles (up to 60 per cent osmium alloys).

• **More Alloys**—Platinum and palladium are gaining in versatility. As temperature requirements rise, more of the pure metals are being alloyed with metals like iridium and osmium, to improve hardness, tensile strength, corrosion resistance, and raise melting points. You can now get some of the platinum metals in purities of 99.999 per cent (most are 99.99).

• **Fabrication**—Both platinum and palladium are easily fabricated with normal metalworking techniques. Iridium becomes forgeable at high temperatures and can be worked into rods. Thorium and ruthenium are difficult and require special techniques. For all practical purposes, osmium is virtually unworkable.

• **Supplies**—World reserves of the platinum group are pegged at about 25 million ounces. At least 40 per cent are in South Africa.

But the supply situation is considerably better than cold statistics indicate. The platinum group is relatively indestructible, so there's a secondary source of metal that gets bigger every year. After long periods of use, the metal can be returned to the refiner at close to the purchase price (assuming the market hasn't moved too much), less refining charges.

Long life makes the metals more attractive from a cost standpoint. Current prices (per troy ounce): Platinum, $82 to $85; palladium, $24 to $26; osmium, $70 to $90; rhodium, $137 to $140; ruthenium, $55 to $60; and iridium, $70 to $75.

(*Please turn to Page* 126)

Where U. S. Supports Research

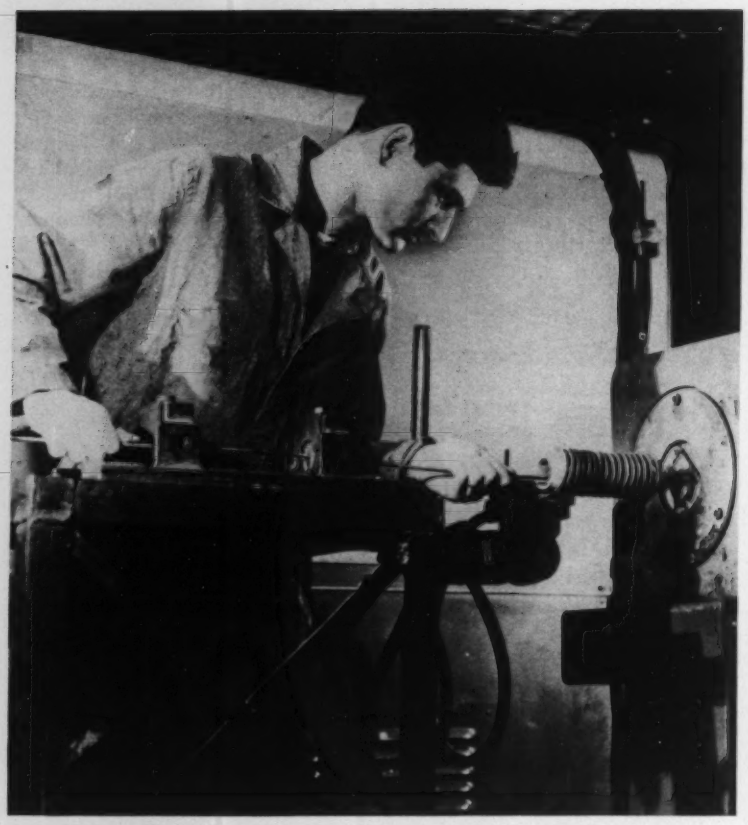
U. S. Air Force

CONTRACTOR	JOB	CONTRACT NO.
Crucible Steel Co. of America	Rolling columbium sheets	AF33(600) 39942
Universal-Cyclops Steel Corp.	Rolling tungsten sheets	AF33(600) 41917
Not Assigned	Power spinning tungsten sheets	PR 8083
Not Assigned	Tantalum sheet rolling	PR 8085
E. I. du Pont de Nemours & Co. Inc.	Columbium extrusions	AF33(600)40700
Wah Chang Corp.	Tantalum extrusions	AF33(600)42396
Wah Chang Corp.	Tungsten extrusions	AF33(600)42395
Allegheny Ludlum Steel Corp.	Molybdenum extrusions	AF33(600)40961
Crucible Steel Co. of America	Columbium forgings	AF33(600)39944
Westinghouse Electric Corp.	Molybdenum forgings	AF33(600)41419
Thompson Ramo Wooldridge Inc.	Tungsten forgings	AF33(600)41629

U. S. Navy—Bureau of Weapons

Universal-Cyclops Steel Corp.	Moly alloy sheets	NOas 59-6412-c
Sylvania Electric Products Inc.	Moly alloy powder sheets	NOas 60-6018-c
Armour Research Foundation	Kroll coreduction and extrusion consolidation of moly alloys	NOas 60-6019-c
Armour Research Foundation	Continuation of above	NOw 61-0548-c
Wah Chang Corp.	Controlled purity moly powder and ingot	NOas 60-6046-c
Fansteel Metallurgical Corp.	Tungsten sheets	NOw 60-0621-c
Battelle Memorial Institute	Ductile tungsten	NOw 61-0677-c
Climax Molybdenum Co.	Tungsten binary alloys	NOas 58-0847-c
Westinghouse Electric Corp.	W-Hf-Re Alloys	NOas 58-0852-c
Lockheed Aircraft Corp.	Refractory metal data handbook	NOas 60-6119-c
New England Materials Lab.	Internally oxidized moly alloys	NOw 61-0316-d
Alloyd Corp.	Ultra high purity moly	NOw 61-0242-c
Martin Co.	Evaluation of coatings for moly	NOw 60-0321-c
Armour Research Foundation	Development of vanadium base alloys	NOw 61-0417-c

4 Rhenium



RHENIUM-MOLYBDENUM alloy is swaged as part of the production process of Chase Brass & Copper Co. Inc. The induction coil at the entrance to the swager heats the alloy to about 1830° F before reduction

IF rhenium were in plentiful supply, it would probably be classified as one of the leading refractory metals. Next to tungsten, it has the highest melting point of any metal (5755° F). Unlike tungsten and most of the other refractory metals, it retains its ductility all the way down to the cryogenic temperature range. The property permits easy forming, shaping, and welding. Elevated temperature strength is higher than that of tungsten, tantalum, or molybdenum. It has excellent electrical characteristics (even at elevated temperatures), high wear resistance, and good corrosion resistance.

Rhenium's metallurgical failings are that it oxidizes at about the same rate as tungsten, and it's difficult to machine.

• **But**—There's one catch, and it's a big one: Rhenium is the rarest of all the refractory metals. U. S. production has been running about 100 lb yearly. It could be increased to 20,000-30,000 lb under ideal conditions. Total Free World reserves are only 1150 tons—fortunately, 750 tons are in the U. S.

Rhenium is a byproduct of a byproduct. It's found in molybdenite contained in some of our Western copper ores. No rhenium deposits have been discovered. (The metal is found in the earth's crust in the ratio of 1 part per billion.) Production potential is geared to: 1. Richness of rhenium deposits in the copper ores. 2. Copper demand.

The U. S. has only two producers. Shortly after World War II, the Chemistry Department of the University of Tennessee became our first producer. Today, the university supplies two grades of rhenium powder, plus several rhenium compounds.

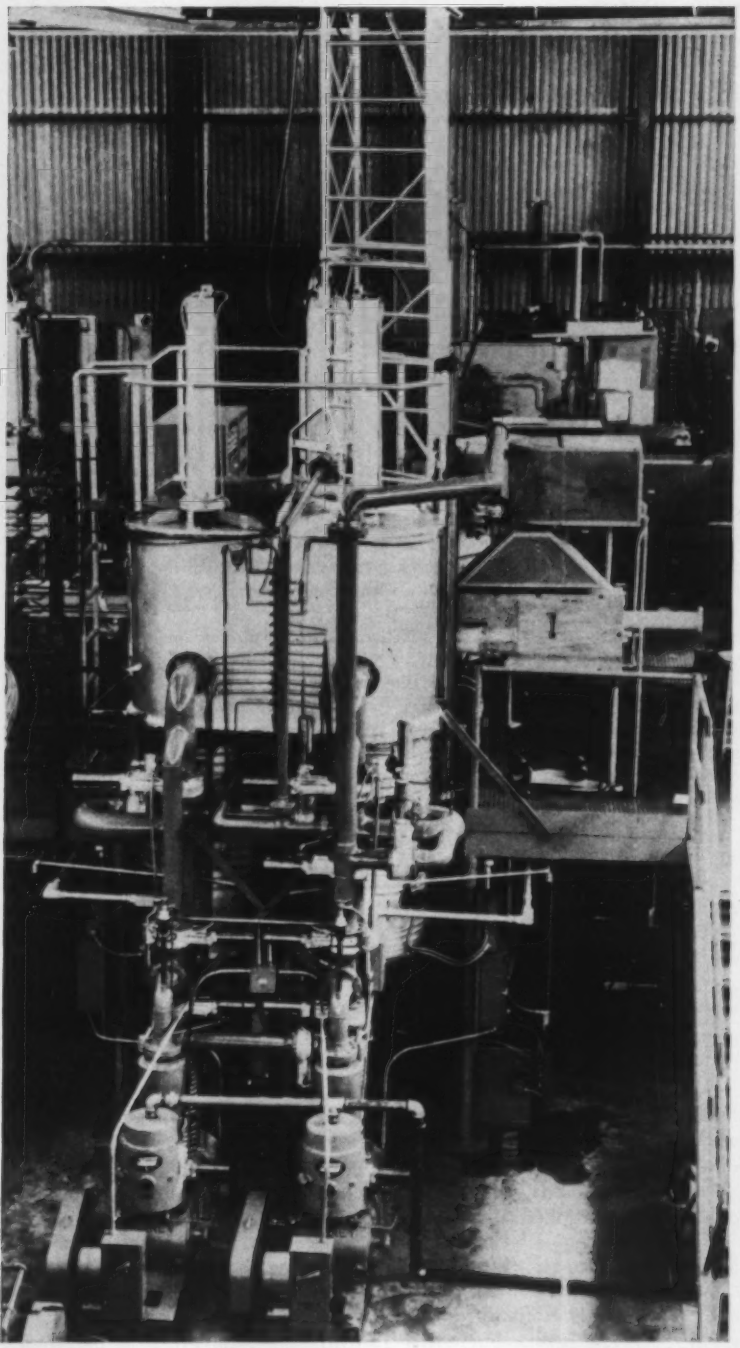
By far the biggest producer, and the only fabricator, is Chase Brass & Copper Co. Inc., which gets the raw material from its parent company, Kennecott Copper Corp. Shieldalloy Corp., Newfield, N. J., recently began supplying a rhenium powder produced by the West German company, Hermann C. Storck.

• **High Priced**—The metal's scarcity makes it expensive. Chase Brass quotes: Powder, $680 a pound; wire, 0.003 to 0.1 in. in diameter, 55 cents to $79 a foot; strip, 0.003 to 0.1 in. thick, $880 to $1700 a pound. Orders in "significant quantities" are subject to discounts —up to 15 per cent for pure rhenium, up to 80 per cent for some of its alloys.

• **Uses and Potentials**—Chase Brass recently announced commercial production of molybdenum-rhenium alloys (50 Re-50 Mo, or 40 Re-60 Mo in rods, wire, and sheets) at "substantially under the price of pure rhenium." Chase Brass says the alloys have advantages over pure moly and pure rhenium. Examples: They have good ductility down to −450° F and do not become brittle upon recrystallization (as is the case with pure moly and tungsten); they can be worked hot or cold, have good weldability, plus favorable electronic and electrical properties. Chase also has a 25 per cent rhenium, 75 per cent tungsten alloy with about the same properties of moly-rhenium. It and pure rhenium are available as rods, wire, sheets.

Some potentials: Electron tubes and other electronic equipment (filaments, heaters, grids, structural components); thermocouples; welding filler rods; small, critical components in space vehicles, missiles, and chemical equipment.

5 Fabrication



ELECTRON BEAM melting equipment at Stauffer Metals Co. is characteristic of the unusual processes employed in the making and fabrication of the refractory metals

MOST of the structural refractory metals aren't easy to form. They present special problems that call for special solutions.

A brief review:

- Most of the metals have to be hot worked. Heat loss is rapid; constant reheating is necessary.
- Most of the metals are brittle at room temperatures; they can be worked only above their transition temperatures.
- When they are heated in air, surface contamination becomes a problem, and metal is lost via oxidation.
- Recrystallization, with resulting brittleness, takes place under certain heat conditions.
- Raw materials are often inconsistent in quality.

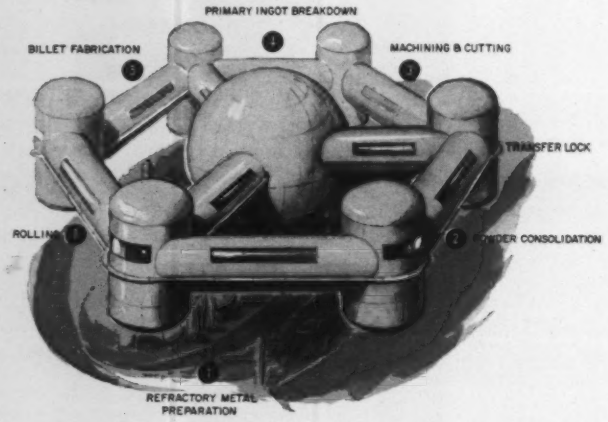
You can fabricate refractory metals with a variety of techniques (see Pages 128 and 129). Companies are forging, casting, rolling, extruding, drawing, joining, cutting, and machining them.

Much work remains to be done. Observes Robert Beatty, general marketing manager, Chemical & Metallurgical Div., Sylvania Electric Products Inc., Towanda, Pa. "The industry still must work out more informed techniques for forging, rolling, extruding, and casting. For example, in forging you have to determine the optimum forging temperature and how much you can reduce the part in one or two blows. The major problem in extrusion is (finding) the best operating temperature. This is also true in rolling, with the added problems of how fast and how thin you can roll."

"The enormity of the problem is brought into focus when you realize that techniques have to be developed for each metal," Mr. Beatty says.

- **The Challenge**—There's a tremendous spread between the cost of raw material and the finished part. For example, tungsten and moly powders sell for $3 to $4 a pound. (Sometimes, as much as 350 lb of material is used to make a 35 lb part.)

So efficiency can bring savings. For example: Increased efficiency is needed in machining. Tungsten is extremely difficult to machine. It must be done hot (probably be-



Universal-Cyclops' proposed Vac-Fab facility is result of . . .

Imagination: Key to Fabrication

● **InFab**—Universal-Cyclops Steel Corp., Bridgeville, Pa., in co-operation with the Navy, is studying the processing of refractory metals in an inert atmosphere to avoid contamination and metal loss through oxidation. An inert fabrication (InFab) facility (a welded steel enclosure, 97 x 42 x 23 ft) has been built to allow rolling and forging in an argon atmosphere at temperatures up to 4500° F. Says Universal-Cyclops: "Because InFab makes possible fabrication at true hot working temperatures without contamination, the number of processing steps can be drastically reduced. Fewer processing operations and anticipated higher product yield may enable InFab to produce superior metals at a cost comparable to those of available exotic metals." The Navy adds: Now it may be possible to process alloys which were rejected because they couldn't be worked on available equipment.

● **Vac-Fab**—Universal-Cyclops has developed a new concept in metallurgical processing to complement its InFab facility. InFab, a pilot plant, was activated in the spring of 1960 to demonstrate the merits of inert gas fabrication at true hot working temperatures. Vac-Fab would be a production facility with improved atmosphere control and greater flexibility.

Says C. P. Mueller, technical director of the firm's Refractomet Div.: "Although our InFab facility is suitable for present day processing requirements, we believe Vac-Fab will be the ultimate method for processing refractory metals. Like InFab, Vac-Fab would allow us to process materials in a noncontaminating environment at true hot working temperatures. But where InFab operates in an atmosphere containing a maximum impurity level of 50 parts per million, Vac-Fab would operate at an impurity level of 1 part per billion. It would thus permit us to attain the ultimate objective: Solid state purification during processing."

● **Sheet Forming**—This is a technique being used to

tween 600 and 1000° F) and the material requires constant reheating. Tool life is short. Certain types of alloying may offer some relief. Several other approaches are being studied. They include new techniques like electron beam machining, electrodischarge machining, explosive metal removal, ultrasonic machining, chem-milling, electrochemical machining.

Pure molybdenum is simpler than tungsten to machine. Pure columbium and tantalum are relatively easy to work, but once they are alloyed (and that's the chief way they'll be used), machining problems are multiplied.

● **Joining** — You run into many problems in this area with tungsten. Welding is difficult. Recrystallization is a real problem. Resistance spotwelding and inert gas arcwelding have been used with varying degrees of success. Electron beam welding is probably the most promising.

Brazing is another possibility. One company reports good results in brazing tungsten to tungsten, tungsten to moly, tungsten to tantalum, moly to moly, and tantalum to tantalum. This company also reports that furnace brazing in hydrogen and argon atmospheres reduces thermal stresses, distortion, and allows joining in some cases below the recrystallization tempera-

fabricate the major refractory metals into sheets of nearly any width. It uses the controlled power spinning process. Wah Chang, one of the companies experimenting with it, says it works like this: The metal is rolled (and the thickness reduced) from a large cylinder on a power spinning machine. Then it's split and flattened into a sheet. Wah Chang calls it Flow-Turning.

Says Douglas Fairgrieve, general manager of the company's Albany, Oreg., plant: It's possible to make a sheet 12 mils thick and in widths of pi times diameter. "Power spinning has none of the limitations of conventional rolling." The method has these additional advantages, claims Wah Chang: 1. It offers better consistency of quality. 2. It can work at lower temperatures (tungsten, for example, at 1500° F). 3. It gives higher unit pressures, higher deformation. 4. It can fabricate brittle material. 5. It doesn't waste a lot of material (only ends have to be trimmed). 6. It is relatively inexpensive and suitable for low batch operations. 7. It can produce closer tolerances across the whole sheet width.

The same basic approach is being worked on by the Metals Div., Stauffer Chemical Co., Richmond, Calif., in co-operation with Solar Aircraft Co., San Diego, Calif. Dr. Donald F. Mastick, general manager of the Stauffer Div., says the process begins with a forged or cast cylinder. On test runs, the process is most promising for moly, columbium, and tantalum. Dr. Mastick believes tungsten can also be shear formed at around 1500° F.

• **Centrifugal Casting**—Oregon Metallurgical Corp., Albany, Oreg., is taking a different approach to making flat rolled products. In centrifugal casting, the hollow centered casting is made, cut, then put through rolls. Currently, the castings have a maximum outside diameter of 24 in.

Oregon Metallurgical uses a consumable electrode, vacuum arc, skull melting furnace. (The copper crucible is water cooled.) The molten metal is poured directly from the crucible into the mold. The pouring process is designed to last no more than 4 seconds. Says Russell Hardy, chief metallurgist: "We can melt and pour any alloy of tungsten, moly, tantalum, columbium, or vanadium in any ring shape." Advantages, says Mr. Hardy: A more fabricable product with a smaller grain size.

• **Explosive Forming**—Propellex Chemicals Div. of Chromalloy Corp. has achieved up to 40 per cent deformation with moly via this method. Most important finding: Moly has a critical deformation rate, so that an explosive that detonates too slowly doesn't produce optimum elongation; the same thing results when the rate is too high. Propellex believes tungsten can also be formed explosively, but higher detonation rates are necessary.

Traditionally, explosive forming has been considered a cold forming operation, but it has also been used for hot forming. Findings of Propellex and others indicate the refractory metals should be worked hot: First, because they don't have enough ductility at room temperatures; second, because deformation is more rapid at higher temperatures.

• **Dynapak**—Westinghouse Electric Corp. is among the companies working with Dynapak and reports: "It is capable of closed die forging or extruding materials which are normally difficult or impossible to form by conventional processing equipment. As soon as we are able to solve such problems as die design, die materials, and lubricants, and provide high temperature heating facilities, we feel this machine will prove to be an asset in the shaping of refractory metals."

• **Electric Spark Forming**—General Electric Co. is taking another approach to high energy forming. The process, called "capacitor discharge electrospark forming," is carried out under water. It works like this: A tremendous, single jolt of electricity creates such high intensity shock waves that the metal being formed is forced into a die. Forming of the part is instantaneous. In the laboratory, columbium has been shaped. The company feels the technique is equally applicable to moly and tungsten.

• **Hydrostatic Extrusion**—Republic Aviation is getting a 400 to 1 extrusion ratio with this process. It works like this: A liquid rather than a solid ram is used to push the metal through a die. The liquid tends to surround the metal, aiding movement. The large size reduction produces a fine grain size, which is much easier to fabricate.

ture. (Tungsten, for example, has been brazed at 1800 to 2200° F.) The remelt temperature of the joint has run as high as 5100° F.

Joining with fasteners is being studied.

• **The Right Equipment**—There's considerable disagreement about the kinds of equipment needed. Most often mentioned as lacking: Adequate vacuum annealing furnaces (around 4000° F maximum). Today, the maximum temperature for big sheets, forgings, and composite structures is 1800° F. And there are only two units in the U. S. which can go that high.

Universal-Cyclops makes this estimate of equipment needs:

• Production size units for extruding in the 2300 to 4000° F range. Only one press (a 12,000 ton unit at Curtiss-Wright Corp., Buffalo, that's owned by the Air Force) is capable of extruding up to 2800° F.

• Facilities capable of rolling up to 4000° F in the absence of air.

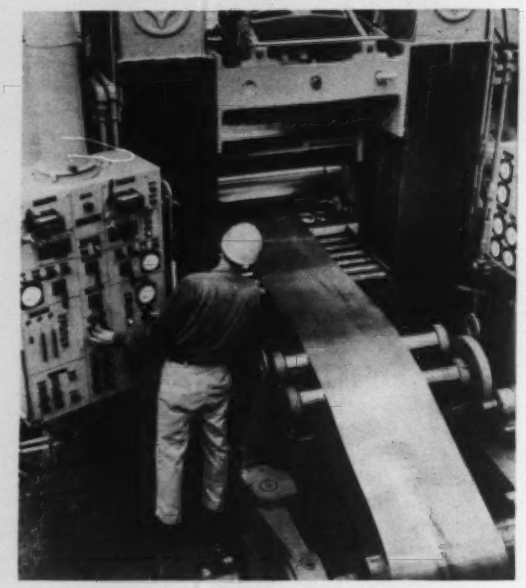
• Mills with 54 in. wide rolls that are at least 45 in. in diameter.

• Production facilities for forging at temperatures up to 4000° F.

• Stretcher leveling equipment capable of operating at high temperatures and under noncontaminating conditions. Bar straighteners that can do the same are also needed.

• **Range of Shapes**—Refractory me-

Newest Columbium Mill Starts Up



"Work it fast, or work it cold." That's the philosophy back of the new columbium mill going into production at Baltimore. It's the Metals Center of E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.

E. M. Mahla, technical manager, metal products, says: "After considering all methods, it was decided to heat heavy sections for forming, handle them in air, and remove the contaminated layer. Lighter sections would be formed cold, with as many intermediate anneals as might be necessary being carried out in vacuum." Reason: Oxygen penetrates into columbium when it is heated.

Most of the major items of equipment are specially constructed. The 2500 ton, Loewy extrusion press is designed for rapid action, and the heating furnace is placed close to the press to speed transfer.

The rolling mill shown (it's also unusual in design) can be used as a two-high unit or in other, more complex arrangements. It will work the metal to plates, sheets, or even foil. The roll separating force can be as high as 5 million lb. It's highly instrumented, so researchers can get answers on the rolling process.

In addition to producing commercial quantities of columbium alloys, the plant will generate information necessary in making better products and in moving up to even larger units.

als are available in about any shape you might want in a broad range of sizes. Facilities for producing shapes vary so much from producer to producer that in only a few cases can you say a given size is universally available. But keep in mind that product mix is increasing every day and that a shape or size not available this week might be a commercial item six months from now.

• **How They're Made**—Three different production methods are used. You should know the difference because a method can have an influence on prices and bearing on purity and ease of working. Here are the methods:

• Press and Sinter: This is the oldest and most widely applied method of producing tungsten, tantalum, and molybdenum. It's a powder metallurgy process. Metal powder is placed in a press and molded. The shape is put into a sintering furnace where the metal particles bond together. Advantages: 1. Powder metallurgy parts cost less than other types. 2. At this stage of the art, you can get more complex shapes more easily.

• Arc-casting: Producers start from powder, bars, or pellets (depending on the metal) and melt in a vacuum with a consumable arc electrode. Claimed advantages: 1. Lower interstitial content. 2. Better machining properties. 3. Higher purity. (A good percentage of the moly, some tungsten, and all columbium are made this way.)

• Electron Beam: This is the newest method of producing ingots. The metal is melted and refined in a high vacuum via bombardment with a beam of electrons. Proponents say: 1. The method produces the highest purity material (and the most easily fabricated) because an electron is noncontaminating and because the melting takes place in an extremely high vacuum. 2. It allows feed of scrap directly into the melt. 3. Allows control of the melt. "The operator completely controls the feed. He can stop it and superheat (several hundred degrees above the melting point of the metal being refined)," says Dr. Mastick.

A niche will probably be found for each process. Also likely: You will see them used in conjunction with one another. For instance: It's practically impossible to make additions of volatile alloys when you use electron beam melting. So most of the columbium metal produced is first electron beam melted, then run through an arc furnace for alloying—and to increase the size of the ingot.

• **In Perspective**—Since the field is new and dynamic, the "outsider" runs into a great deal of apparent confusion. The situation will get better. Some of the most talented engineering minds in the country are in this industry. Progress should be rapid. Before much longer, refractory metals should become as commonplace in metalworking as steel, copper and aluminum.

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- vacuum heat treating of columbium/tantalum alloy
- induction recrystallization of tungsten rods

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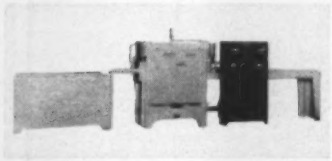
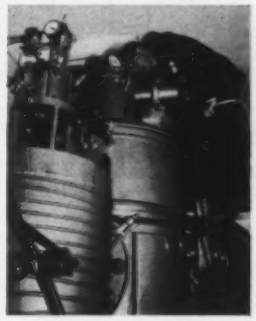


Type M-Y 23 Moly Element Furnace



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Sinter plant capacity increased threefold in last decade . . .

Greater Use Expected for Sintered, Pelletized Ores

• PRODUCTION of pellets and sinter should continue to grow as it has in the last decade. In that period, sinter capacity was tripled, while pelletizing was pulled out of the laboratory and put to work.

• GREATER USE of instrumentation and automatic controls in ore beneficiation plants will call for the most highly skilled operating personnel available.

• MORE GENERAL use of the agglomerates as blast furnace burden, parlayed with increased automation of blast furnace operations, will continue to cut coke rates and increase hot metal output.

Those predictions were made by M. J. Greaves and Alan English of Arthur G. McKee & Co., Cleveland, at the first International Symposium on Agglomeration, Philadelphia. It was sponsored by the American Institute of Mining, Metallurgical, & Petroleum Engineers (AIME).

• Researchers continue to study the sintering process—making improvements in applications and looking for new uses.

Lower heat consumption and generally better economics are reported from mixed firing and hot air sintering vs. sintering with ambient air. Tests by Lurgi Gesellschaft fur Chemie & Huttenwesen, Frankfurt, Germany, featured the burning of liquid and gaseous fuels in a hood over the sinter strand and introduction of air at temperatures up to 1475° F.

The importance of proper sizing of sinter particles on the strand is emphasized by Lurgi researchers. The effect of sinter size on efficient cooling is stressed by experimenters at Head Wrighton & Co. Ltd., London, England, and at Dravo Corp., Pittsburgh.

Broader application of the continuous sintering process is under investigation at Dwight-Lloyd Laboratories, McDowell Co. Inc., Cleveland.

• Increased use of self-fluxing sinter, which would make for closer metallurgical control of the iron-making process, is getting greater attention from steelmen.

Researchers are studying the effect on the strength and reducibility of the sinter as changes are made in the chemical composition. Example: Studies at the Applied Research Laboratory, Monroeville, Pa., of United States Steel Corp., indicate improvement in reducibility as basicity is increased and the percentage of ferrous oxide is lowered. Good physical strength was reported for all self-fluxing sinters tested.

(*Please turn to Page* 136)

FIVE-DEEP

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to help you profit with UCM's "FIVE-DEEP" Ferroalloys

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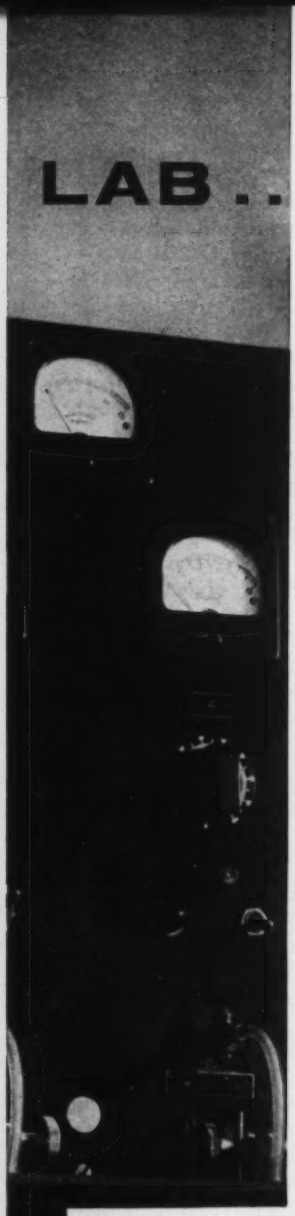

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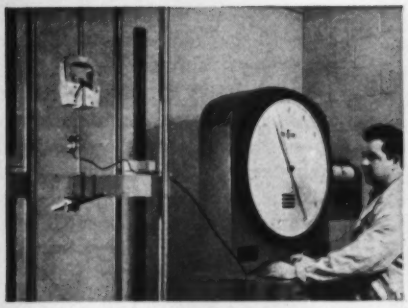

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Pelletizing puts premium on fine materials

(*Concluded from Page* 132)

Similar studies were undertaken—with comparable results—at Kokura Steel Works, Sumitomo Metal Industries Ltd., Kokura, Japan.

Better sinter rates were noted as dolomites with finer crystalline structure were used in the mix—even when all dolomites were screened to the same size—in experiments run at Bethlehem Steel Co., Bethlehem, Pa.

Better cold strength and size distribution of sinter from Australian ores are the aims of experiments at Broken Hill Proprietary Central Research Laboratories, Shortland, New South Wales. And suitability of highly basic sinter for acid or basic steelmaking processes is under study at the Royal Institute of Technology, Stockholm, Sweden.

• Process computer control of the sinter plant doesn't decrease the number of operating personnel—but it puts a premium on operator skill and training.

In the automated plant, the operator, with his knowledge of the sintering process, is replaced by an expensive computer control system, say R. F. Jennings and A. Grieve of Huntington Heberlein & Co., Ltd., London, England. That system is presumably supervised by a skilled computer technician, who cannot be expected to also be an expert on sintering. Result: No saving on labor costs. Increased capital and maintenance costs can be justified only if automation makes marked improvements in plant operation.

Some gaps still exist in sinter plant instrumentation, say Messrs. Jennings and Grieve. Example: Continuous measurement of moisture in the mix and direct measurement of sinter bed permeability aren't yet realized.

Some steelmen caution against full automation of the sintering process without careful evaluation of technical and economic advantages. But one-man control systems—like the one in use at Yawata Works of Yawata Iron & Steel Co. Ltd. (Japan)—are being used successfully.

• Economical balling and pelletizing machinery should help the steel industry exploit lower grade ores.

Fine particles of ore, carbon, and flux that wouldn't be suitable as blast furnace feed are made into desirable burden material by addition of a bonding agent, balling, then firing. The pellets produced can be processed in a sinter machine, or fire hardened and fed directly into the blast furnace.

Pelletizing discs are marketed by Dravo Corp., Pittsburgh, and McDowell Co. Inc., Cleveland. A multiple cone, drum pelletizer is used in the Agglomeration Laboratory, Koppers Co. Inc., Pittsburgh. It handles several types of fine material. Examples: Specular hematite and magnetite concentrates.

Pellets produced by balling drums are fire hardened on horizontal grate machines at E. W. Davis Works, Silver Bay, Minn., of Reserve Mining Co.

Recoverable ore units in material from the Wabush Lake deposit, in Labrador, consist of about one-third fine ground magnetite and the rest a coarser specularite. Pilot tests run by Pickands Mather & Co. at Duluth, show that the material can be bonded satisfactorily. Physical quality of the pellets is slightly less than that of taconite pellets made during parallel tests.

• Popularity of pelletizing with steelmen should grow as more is learned about the process.

Tests at Cleveland-Cliffs Iron Co.'s research laboratory, Ishpeming, Mich., show beneficial effects from proper grind, finish size, and firing temperature on compressive strength, abrasion resistance, and other pellet properties. Studies made at the University of Toronto (Ont.) point up the importance of proper firing temperature—its effect on strength and shrinkage.

Researchers at United States Steel's Applied Research Laboratory stress the importance of adding the right amount of moisture to the mix for optimum pelletizing. That amount of moisture depends largely on particle size, size distribution, porosity, and the type of ore.

Tests at Broken Hill Proprietary Central Research Laboratories (Australia) show that addition of a small percentage (about 1 per cent) of slaked lime to the mix increases dry strength and crack resistance of the pellets during drying and gives the fired pellets greater strength. It is also said to reduce the time needed for hardening.

RED HOT PROBLEM-SOLVER

There are three basic reasons why this brand has been stamped on so many successful projects recently.

REASON NO. 1—Platinum Metals have a superior *combination of properties* . . . resistance to high temperatures, exceptional corrosion resistance, catalytic action.

REASON NO. 2—Platinum Metals *perform* and continue to serve—often where no other materials can endure.

REASON NO. 3—Platinum Metals are *cheaper* than you think, because of their high recovery rate.

We make Platinum Metals in all shapes and forms . . . sheet, strip, foil, wire, tubing, gauze, salts and chemicals. And we operate complete *catalyst* and *scrap recovery* units. Clads and composites also available in many forms.

We are manufacturers of products in all the Platinum Group Metals: *ruthenium*, *rhodium*, *palladium*, *osmium*, *iridium* and *platinum*.

Bulletin No. P-6 tells our story. Write for it.

BISHOP

J. BISHOP & CO. *platinum works* / MALVERN, PENNSYLVANIA

A JOHNSON MATTHEY ASSOCIATE — "METALS FOR PRECISION AND PERFORMANCE"

OFFICES: NEW YORK • PITTSBURGH • CHICAGO • ATLANTA • HOUSTON • LOS ANGELES

THE STOCK *Behind* THE STOCK...

How CSS Can Give You Any Quantity of Stainless Steel When You Want It

Large and diversified warehouse stocks of stainless steel ready for immediate shipment from The House of Stainless.

Semi-finished and finished stainless steel, in even greater tonnage, maintained at our major mill sources, ready for immediate shipment or final processing to your exact specifications.

To avoid costly inventories, economy-minded buyers today are demanding quick deliveries of all stainless steel products.

Anticipating this trend, Chicago Steel Service has inaugurated a program that not only maintains large and diversified warehouse stocks of stainless steel, but also makes available to you the prompt deliveries of any quantities, types or sizes of stainless through the semi-finished and finished stocks carried by our producing mills.

While the illustrations show flat-rolled products, the same program applies to all our stainless steel commodities.

For help on quick deliveries, metallurgical or technical assistance, it will pay you to call The House of Stainless.

STEEL SERVICE CENTER INSTITUTE

The House of Stainless

STEEL AT YOUR SERVICE

Just phone LAfayette 3-7210

CHICAGO STEEL SERVICE COMPANY

Kildare Avenue at 45th Street, Chicago 32, Illinois • Mailing Address: Box 6308, Chicago 80, Illinois

Milwaukee District Office: 757 N. Broadway, Milwaukee 2, Wisc. Telephone BRoadway 3-7874
Sales Representatives at Bloomington and Rockford, Ill.; Indianapolis and South Bend, Ind.; Davenport, Iowa; Grand Rapids, Mich., Minneapolis, Minn.; Appleton and Wausau, Wisc.

YOUR DEPENDABLE SOURCE FOR CARBON AND STAINLESS STEEL; ALSO INCO ALLOY BAR, WIRE AND STRIP

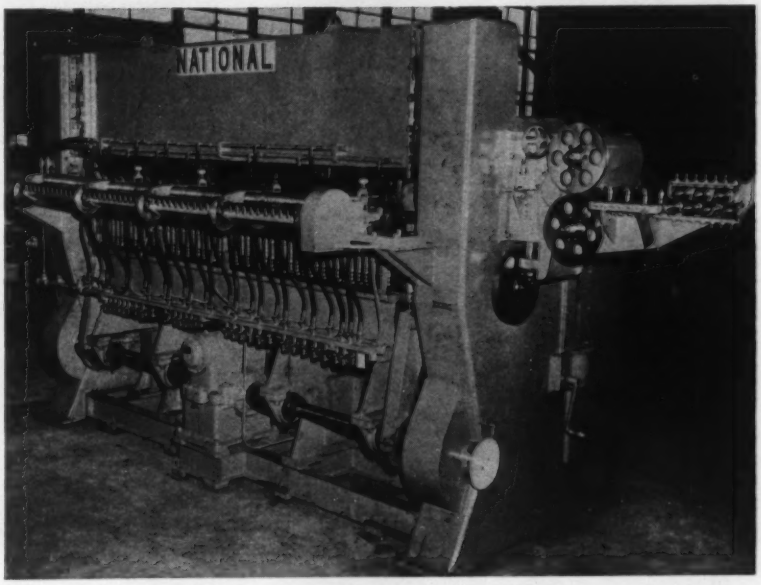
Machine Welds Metal Fabric, Paving Mesh

A HIGH output, fabric welder is rugged, versatile, and highly accurate. It combines low maintenance demand with quick changeability.

Used to produce fencing, utility fabric, concrete reinforcement and light paving mesh, the machine has a working range of 2 to 12 in. spacing on wire of 4 to 10 gage. Maximum mat width is 8 ft. Production rate is 70 strokes per minute. The automatic line consists of a wire straightener, welder, trimmer, slitter, indexing device, and coil winding reel.

The single head welder is fitted with 50 welding guns, coupled in series to twenty-five 15 kva transformers.

For further information, *write* National Electric Welding Machines Co., Bay City, Mich.



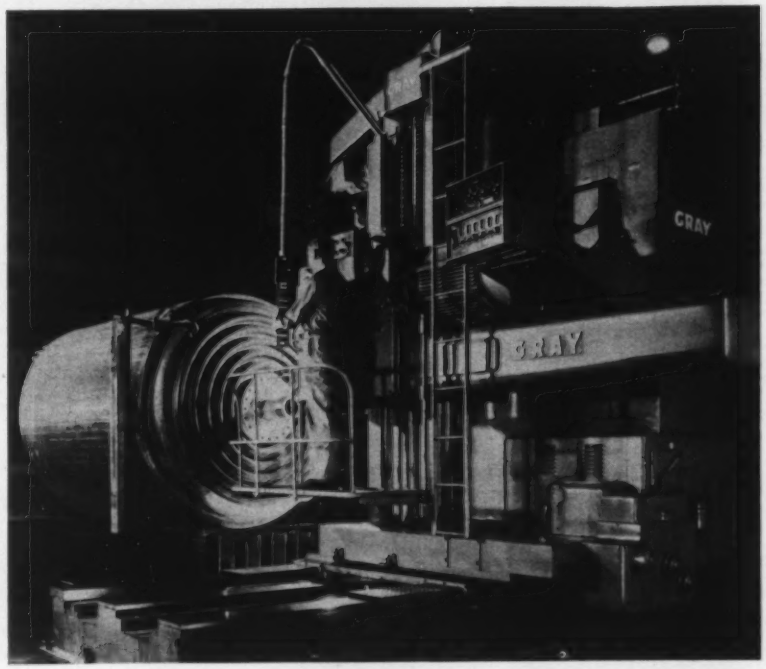
Unit Good for Short Run Boring, Drilling, Milling

SHORT RUNS are said to be practical and profitable on the Gray horizontal boring, drilling, and milling machine. The unit is equipped with a Norden Space Setter, readout numerical control, that helps to save time and provides greater accuracy.

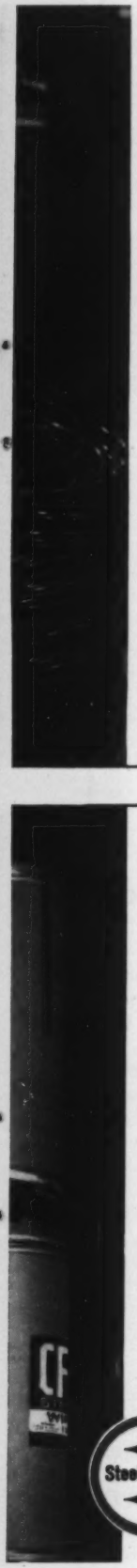
The Space Setter system offers progressive steps to full tape control. The readout provides a basic and infallible counting or measuring system. A zero offset feature establishes zero readout at any predetermined reference point on the workpiece. Drawing dimensions can be checked on the readout panel. The company says the Space Setter system allows accuracies within 0.001 in. and is unaffected by line voltage.

The Televersal attachment permits low mounting, resulting in constant rigidity, heavier feeds, and faster cuts. The three spindle

(*Please turn to Page* 142)



CF&I
STEEL
WIRE



CF&I Spiders and Fibre Drums are packaged for your production

RETURNABLE SPIDERS

Here's the experience of one typical user:

> "When we used small coils, we lost several feet every time we changed a coil. Now, using CF&I Spiders, we have cut our waste 80%. We've also improved the quality of our end product because we don't have to reset the machine. CF&I Spiders have reduced our handling and storage problems, too, because you've got a lot of wire in one easy-to-handle package."

CF&I-Wickwire Returnable Spiders hold 2000 to 3000 lbs. of wire in one continuous length . . . consist of a center core welded to a heavy base plate. Available in two standard types from our mills—with core diameters of 18″ and 22″.

OPERATING ADVANTAGES: Increased production, decreased labor, less scrap loss, ease of handling and improved quality of end products.

FIBRE DRUMS

Here's what one satisfied user said about CF&I Fibre Drums:

> "They're an answer to the problem of unclean wire. The metal cover and locking band protect the wire from grime and other corrosive elements. The fact that they hold up to 600 lbs. of wire in one continuous length enables us to run our machines for a longer time than when we used small coils."

Fibre Drums hold 250 to 600 lbs. of wire in one continuous length . . . consist of a sturdy fibre container with center core, metal cover and locking band which protect the wire from atmosphere and dirt. The wire is directly withdrawn from the drum into your equipment. Available in full and half drums.

OPERATING ADVANTAGES:

- Cleaner wire, because the sealed drum protects the finish on the wire.
- Increased production, because of smooth pay-off and the fact that your machines have less downtime than with conventional coils.
- Less storage space required, because Fibre Drums can be stacked compactly on each other.
- Quick, easy handling . . . drums can be shipped strapped to a wooden pallet for convenient handling by a fork-lift truck.

ONLY CF&I OFFERS A TOTAL OF TEN DIFFERENT WIRE PACKAGES. You've just read how two of these packages have increased the production efficiency of leading manufacturers. One or more CF&I-Wickwire Wire packages can do the same for you. Our engineering staff will be happy to study your operation and recommend the type that best meets your requirements. For complete details, write your local CF&I sales office.

CF&I STEEL MADE IN U.S.A.

THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland • New York
Sales Offices in Key Cities

8137

(*Continued from Page* 139)

work head swivels and can be locked at any alternative angular position for multiple setup jobs. A self-contained jib crane with a 2000 lb lifting capacity makes the operator independent of other shop facilities for tool changes. The unit also features a power operated draw bar, and the electric "woodpecker" multiton column and head that may be set by pushbutton within 0.00025 in.

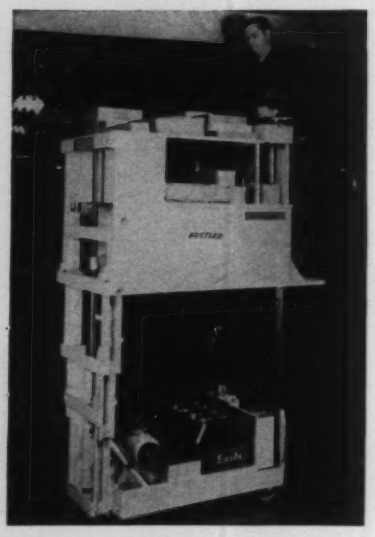
For further information, *write* Dept. V-3113, G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio.

Truck Permits Fast Work In Narrow Bin Aisles

SELECTION of small and loose parts from bin areas with narrow aisles can be a faster and less costly job with the Hustler Bin Selector truck.

The unit positions the operator while he is in the driving position. The truck can operate in aisles down to 36 in. in width and the operator can select parts in any direction without obstruction or lifting.

Top operating speed is 4.5 mph. The truck has two shelves that the operator lines up with the bin. Parts selected are easily moved to the shelves and any counting can be easily done at the bin level. The operator raises or lowers to any shelf height as he moves forward or reverse.



The unit is equipped with built-in 225 ampere-hour batteries, charger, deadman brake, and telescopic, all-level steering.

For further information, *write* Heifred Corp., Church & Elm Streets, Willoughby, Ohio.

Data System Features High Computing Ability

AN INTERMEDIATE data system, the IBM 7072, has been developed for commercial and scientific applications that require powerful computing ability rather than high volume input and output of data.

The 7072 will be able to process magnetic tapes recorded during engineering tests despite a difference in the "language" of the test cell and the computer. Binary data are entered directly into the computer, where they are converted into decimal form automatically and processed for immediate use by engineers.

Typical jobs for the computer include creation of mathematical models to test product designs, systems, and operational theories, analysis of products and structures to determine their ability to withstand stress, reduction of large volumes of data to a form in which they can readily be analyzed, solution of equations using techniques such as matrix algebra and vector analysis.

For further information, *write* Data Processing Div., International Business Machines Corp., 112 E. Post Rd., White Plains, N. Y.

Internal Grinder Features Improved Performance

PARTS such as diesel nozzles can be ground at greatly increased production rates with better concentricity, accuracy, and surface finish on the Bryant double end internal grinder.

The unit is designed for grinding both a straight and tapered bore at a single chucking of a workpiece. Two opposed wheel slides and a rotary indexing worktable carrying two workheads permit two workparts to be ground simultaneously.

The rotary indexing worktable is centered between straight bore and taper bore grinding units. Units may be operated simultaneously or individually. Machine operation is automatic. Operator loads and unloads.

Other features include automatic new wheel dress cycling, compound axial and angular slide (permitting reciprocal grinding of the tapered bore), and diamond sizing for both straight and taper bore grinding.

For further information, *write* Bryant Chucking Grinder Co., Springfield, Vt.

Fastener and Improved Drives Introduced

IMPROVEMENTS have resulted in more compact, higher horsepower, Dynaspede drives, says Dynamatic Div., Eaton Mfg. Co. Dynaspede is the division's term for water cooled, eddy current, variable speed drives. Five model sizes are involved in the refinements.

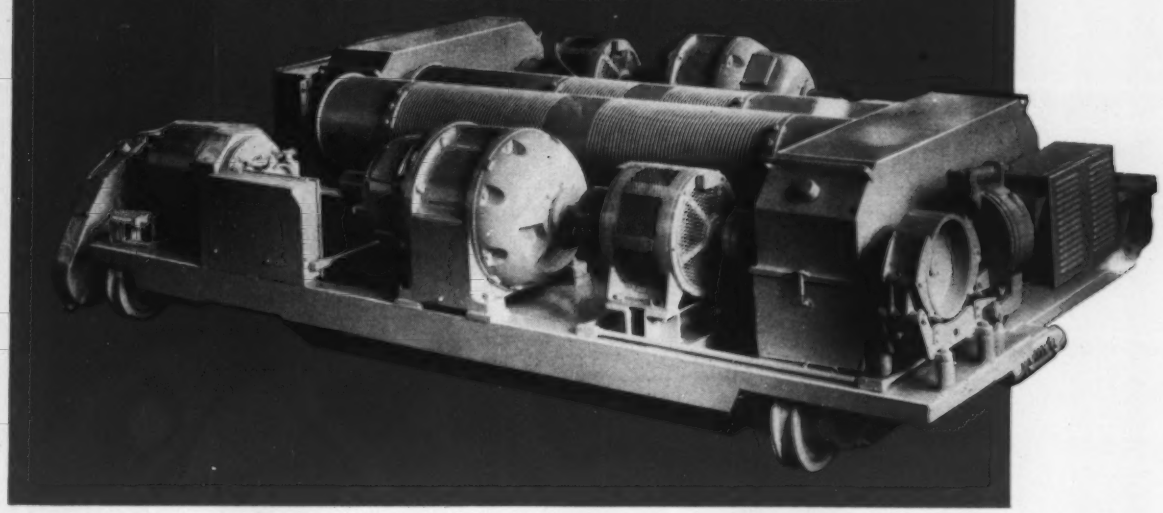
One example: The Dynaspede No. 212 (formerly rated at 40 hp at 1800 rpm) is now called the No. 2123 and is rated at 75 hp. The division also says that torque capacity was increased through better application of magnetic materials.

Other developments from Eaton include an industrial fastener design called Torqtite (from the Reliance Div.) that is tamperproof and eliminates driver slippage, worm gear speed reducers (from Cleveland Worm & Gear Div.) with fan cooling and increased

(*Please turn to Page* 146)

For Northern Cranes

EZOMATIC
CRANE CONTROL



EZOMATIC *is Smooth, Simple, Dependable*

EASIER *to operate*

EASIER *to maintain*

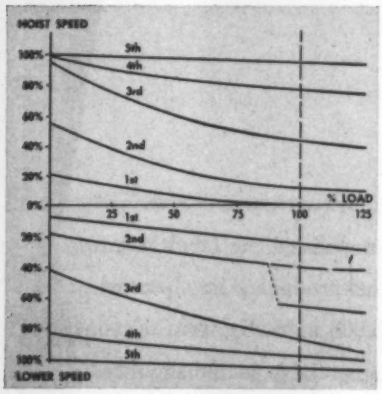
EASIER *to understand*

EASIER *to handle any load*

The new simplified, smooth, accurate control for alternating current hoist motors utilizing full magnetic control combined with an eddy current brake. This improved control arrangement is easier to operate, easier to maintain, makes handling any load easier, safer, more accurate. Regardless of load the speed characteristics both hoisting and lowering are excellent, allowing smooth handling and accurate spotting of any load.

Standard control components familiar to all electrical maintenance and operating men are used throughout. Circuits are simple and readily understandable. No complicated electrical schemes. Used with a standard eddy current brake eliminating mechanical and electrical wear.

Excitation of the eddy current brake is automatically controlled by the motor speed allowing extra smooth acceleration. If fast acceleration is desired it may be obtained by moving the master switch to the last point, thereby eliminating the eddy current brake excitation. Off point braking is provided automatically to assist the motor brake in stopping the load. The motor brake is automatically applied in lowering if the eddy current brake excitation should be interrupted. Speed curves can be readily changed in the field, either up or down by a simple adjustment. When very heavy loads are handled extra lowering speeds are automatically provided.



TYPICAL SPEED CURVES WITH EZOMATIC CONTROL

For further information write to

NORTHERN ENGINEERING WORKS

210 CHENE STREET • DETROIT 7, MICHIGAN

If you use tonnage oxygen in any process . . .

How? Simply by owning a Dravo-Linde AG tonnage oxygen facility at your plant or mill site. The financial and operational reasons for owning your steam, water and compressed air facilities are equally valid and applicable to the new utility—oxygen. In fact, a steel-producing or chemical process plant can realize savings on oxygen costs of $500,000 to $1,500,000 annually from user-owned and operated Dravo-Linde AG plants. Proportional annual savings can be expected should you elect to lease such facilities. As remarkable as they may seem, these savings of up to 40% are based on estimated costs of $15.00 per ton on a demand of 200 tons/day to $9.60 for 1000 tons/day of purchased gaseous oxygen from on-site plants. The heart of the process—the Linde AG air separation unit—incorporates the latest developments in economical low-

pressure operation and possesses an unequaled safety and reliability record. All air is compressed or expanded through centrifugal equipment. Maintenance is minimized. Defrosting is not required more frequently than once a year. Simplicity of plant operation permits quick and easy training of your present personnel. But the savings do not stop here. Integration of a Dravo-Linde AG oxygen plant with your existing facilities, made possible by Dravo's extensive experience in engineering and constructing major installations and utility services for industry, can reduce both investment and operating costs even further. Prove these facts as they relate to your own operation. Contact P. J. Berg, Dravo Corporation, Pittsburgh 22, Pennsylvania. EXpress 1-2600.

DRAVO
CORPORATION

(*Continued from Page 142*)

horsepower capacity (up to 80 per cent or more), and a motorized speed variator (also from Cleveland Worm & Gear Div.) that is nearly the same size as a constant speed motor of the same capacity. The products will be displayed at the Design Engineering Show in Cobo Hall, Detroit, Booths 656, 660, and 662.

For further information, *write* Public Relations Dept., Eaton Mfg. Co., 739 E. 140th St., Cleveland 10, Ohio.

Worm Gear Lubricant Cuts Efficiency Loss

UP TO A 25 per cent decrease in efficiency loss has been demonstrated in dynamometer tests of a worm gear lubricant. Two grades—Conedroil A and Conedroil B—provide good wettability and extreme pressure characteristics.

Conedroil A provides lubrication exceeding AGMA No. 8 and 8A requirements. Conedroil B exceeds AGMA No. 7 requirements.

For further information, *write* Shear-Speed Chemical Products, a division of Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

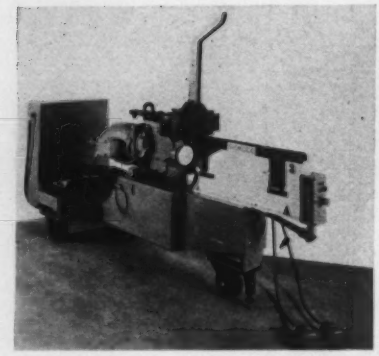
Strapping Units Suitable For Production Lines

HIGHER tension, faster feed, rugged construction, and unlimited strap takeup help fit the Signode M20L strapping machine into production packaging lines.

The unit supplements Signode's line of standard M20 PSMs. It has the same tensioning and sealing head and structure, but differs from the automatic models in having only the lower strap chute.

With the Model M20L, the operator positions the package, steps on the feed switch, inserts strap in the lower chute, and then steps on the cycle switch to tension and seal the strapping.

Standard chute lengths are 18, 24,



or 30 in. Vertical strap guides which deflect the strapping over the package toward the operator, will clear packages 15, 21, or 27 in. high. The lower chute can be fitted into a narrow slot between the ends of conveyor sections. Supplementary table or roller sections are available as accessories.

A 3 hp, 1800 rpm, 3 phase, 60 cycle, dripproof motor is standard.

For further information, *write* Signode Steel Strapping Co., 2600 North Western Ave., Chicago 47, Ill.

Unit Makes Uniform, High Density Molds

A MOLDING machine made by Taccone can turn out green sand molds capable of producing precision, thin wall, engine block castings.

The controlled thin sections result from uniform, high density molds which prevent mold wall movement or swelling. The company says uniform, high density molds not only permit reduction in casting weight, but also improve the metal structure and reduce the number of risers required.

The molds are produced by applying pressure, through the Taccone hydraulic Power Pac, against a pneumatic compensating pad. Green sand molds up to 45 in. deep have been repeatedly produced where uniform mold hardnesses between 95 and 100 (Dietert) have been obtained throughout the mold.

Simple, direct, vertical stroking of the machine eliminates the need for heavy jolting or vibrating for added mold density. The machine can be adjusted through a pressure control for any desired mold hardness up to 100.

The units are available for flask sizes up to 72 in. wide, 140 in. long, and 45 in. deep for all classes of green sand molding, including jobbing.

For further information, *write* Taccone Corp., P. O. Box E-512, North East, Pa.

Nylon Abrasive Belt Produces Fine Finishes

LONG life and fine microinch finishes are features of a nylon abrasive belt introduced by Armour. The company says the belt has many applications in the metalworking and plastics industries.

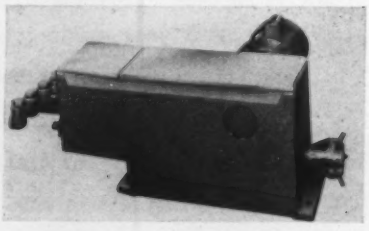
The product is heat and water resistant, does not load up readily, and excels in applications requiring fine finishes on irregular surfaces. It's available in a variety of grain sizes ranging from coarse to superfine and in belt lengths to fit any belt sanding machine. Widths to 24 in. are available.

For further information, *write* Coated Abrasives Div., Armour Alliance Industries, Alliance, Ohio.

Working Parts Enclosed on Chemical Metering Pump

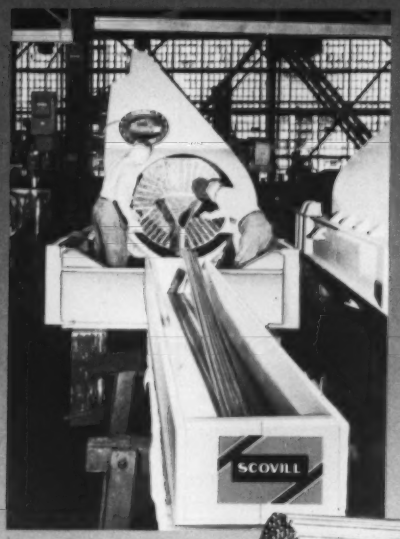
A LOW FLOW, controlled volume metering pump (the Milroyal) for liquid chemical feed systems features enclosed working parts. It can be equipped with a leakproof, diaphragm, liquid end or a conventional, packed plunger, liquid end. The pump will accurately meter many types of liquids such as acids, toxic chemicals, and water treating chemicals. Capacity adjustments can be made while the pump is running—either manually or automatically from a control signal.

Capacities of Milroyal pumps range from 0.89 gallon per hour for pressures up to 4470 psi to 88.0



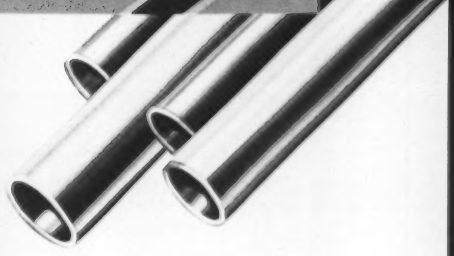
where trouble-free performance is a matter of

national security



each of newest
nuclear subs
will take aboard
MORE THAN
4 MILES
of Scovill
cupro-nickel, 30%
heat exchanger tube

SCOVILL



We're proud to be making this important contribution to the long-service dependability of these nuclear-powered submarines.

Like all other components of their nuclear-powered propulsion machinery and equipment, the Foster Wheeler main condensers, shown above being tubed with Scovill Cupro-Nickel, 30% Heat Exchanger Tube, have passed the most exhaustive performance tests it has been possible to devise. The same tube specification is also being installed in the ejector condensers. All of the tube is electronically tested on new equipment at the Scovill Tube Mills before delivery.

Scovill Cupro-Nickel, 30% Heat Exchanger Tube has a long record of trouble-free service on U. S. Naval vessels and those of many other nations. It is a first choice of design and operating engineers where salt water or corrosion conditions are severe, particularly at elevated temperatures and when the circulating media travel at high velocities. The corrosion resistance is excellent; strength of the alloy remains constant over a wide temperature range.

Why not discuss your own heat exchanger tube conditions and problems with Scovill Technical Service . . . considered by many the most experienced in the field.

HEAT EXCHANGER TUBE

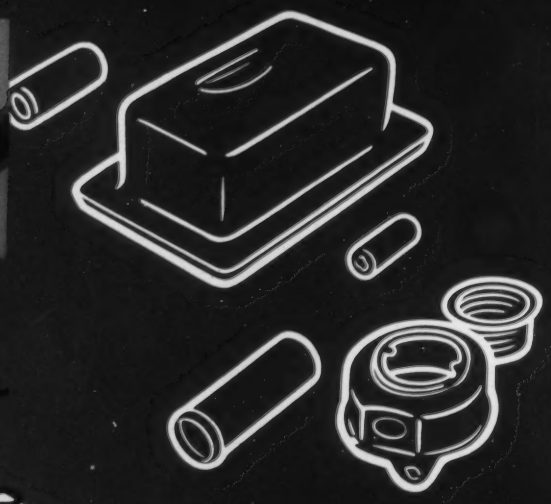
for Applications from Marine to Petrochemical, from Compressor Intercoolers to "Cat-Cracker" Exchangers, in these popular Alloys . . . Phosphorized Admiralty • Admiralty • Arsenical Admiralty • Red Brass, 85% • Deoxidized Copper • Arsenical Copper • Cupro-Nickel, 10%-20%-30% • Aluminum Brass • Aluminum Bronze, 5% • Muntz Metal • Duplex Tube.

SCOVILL MANUFACTURING COMPANY, Mill Products Division, 99 Mill Street, Waterbury 20, Connecticut. Phone PLaza 4-1171.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

18SC59

SCOVILL



has a word for the wise aluminum fabricator

THE WORD IS . . .

Truspec®

THE WELL-BEHAVED ALUMINUM SHEET

Aluminum is not new to Scovill. We were one of the very first mills in the country to start processing this new metal when it became commercially available in the late 1880's. But commercial Aluminum Sheet produced to the same closely controlled specifications Scovill established for Brass Strip was a NEW IDEA when we introduced TRUSPEC Aluminum.

Fabricators have long wanted Aluminum like this . . . because it can so effectively help them control such common problems as "earing" and "orange peel" effect . . . because it can reduce time-consuming adjustments and promote longer tool life . . . because Scovill has made available long-length coils (up to 100 lbs. per inch of width) and the sheet itself is remarkably uniform in gauge, from side to side and end to end.

Scovill believes the customer now gets what he wants . . . in TRUSPEC Aluminum Sheet identified by this Trademark.

it PAYS to specify . . .

BRASS • COPPER • ALUMINUM

MILL PRODUCTS

identified by this trademark

SCOVILL

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

★★★★★★★★

made better to bring out the BEST in your products

Scovill Manufacturing Company, Mill Products Division, 99 Mill St., Waterbury 20, Conn. Phone PLaza 4-1171.

ISC54

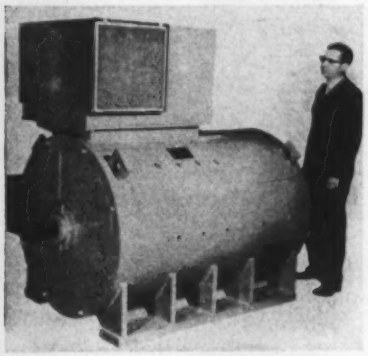
gallons per hour for pressures to 170 psi. Up to nine units can be driven by one motor for special applications. Models use motors from ¼ to 1 hp (larger units are being developed).

For further information, *write* Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia 18, Pa.

Vibration Lowered on Motors, Generators (dc)

REDUCED inertia for faster response and increased mechanical stability for lower vibration are advantages of Type SK direct current motors and generators.

Typical machine ratings are 500 hp at 850 rpm, 240 volts, dripproof enclosure and 800 hp at 1150 rpm, 600 volts, force ventilated for heavy industrial applications. Corresponding generator ratings offered with dripproof construction are 480 kw at 850 rpm for 250 volt dc power supply.

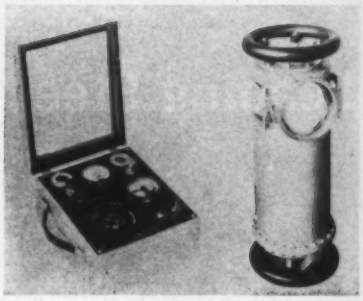


For further information, *write* Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Portable X-Ray Units Penetrate 1⅞ in. Steel

A PORTABLE x-ray unit called the Baltospot 150 is available in two models—150-P and 150-D. Each can penetrate up to 1⅞ in. of steel.

The 150-P incorporates a 360 degree tube for circumferential radiography, yet is adaptable to single beam or directional use. The "D" model features a wide angle, 60 degree tube that allows up to a 50 per cent greater linear exposure at any given distance. Weight: 55 lb for each model.



Also announced by Balteau are two design changes on the Baltograph 300, portable x-ray unit. Weight has been reduced 14 lb (from 150 to 136 lb) and another version is available which incorporates a 360 degree x-ray tube for circumferential radiography as well as single beam use.

For further information, *write* Balteau Electric Corp., 5 New St., Stamford, Conn.

Diode, Thyratron Color Change Predicts Failure

LIFE indicating thyratron and diode tubes that predict tube failure 300 hours ahead of time have been developed by Reliance. They're standard on Reliance V-S Drives, can be used on many other makes or processes employing thyratrons or diodes.

The tubes change color from normal blue to neon red before failure. Tests in service indicate that tube life has been doubled as a result of new design and manufacturing techniques. They're available in 2.5 and 6.4 ampere ratings—pin or lug base.

For further information, *write* Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio.

Two Speed Ratios Offered On Screw Conveyor Drive

A COMPACT, screw conveyor drive (Series 100) for short conveyor flights and low horsepower requirements has been developed by Dodge.

The series comes in two speed ra-

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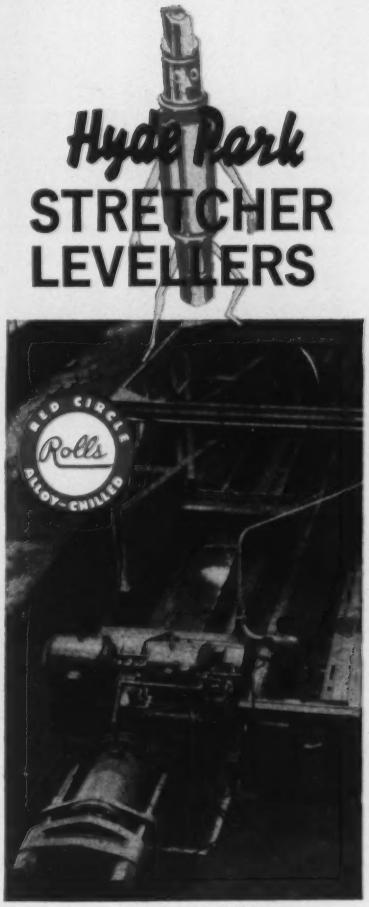


Hyde Park Levellers have a complete range of stretching capacities from 150 to 1250 tons—for levelling ferrous and non-ferrous sheets in sizes up to 120 inches wide by 500 inches long.

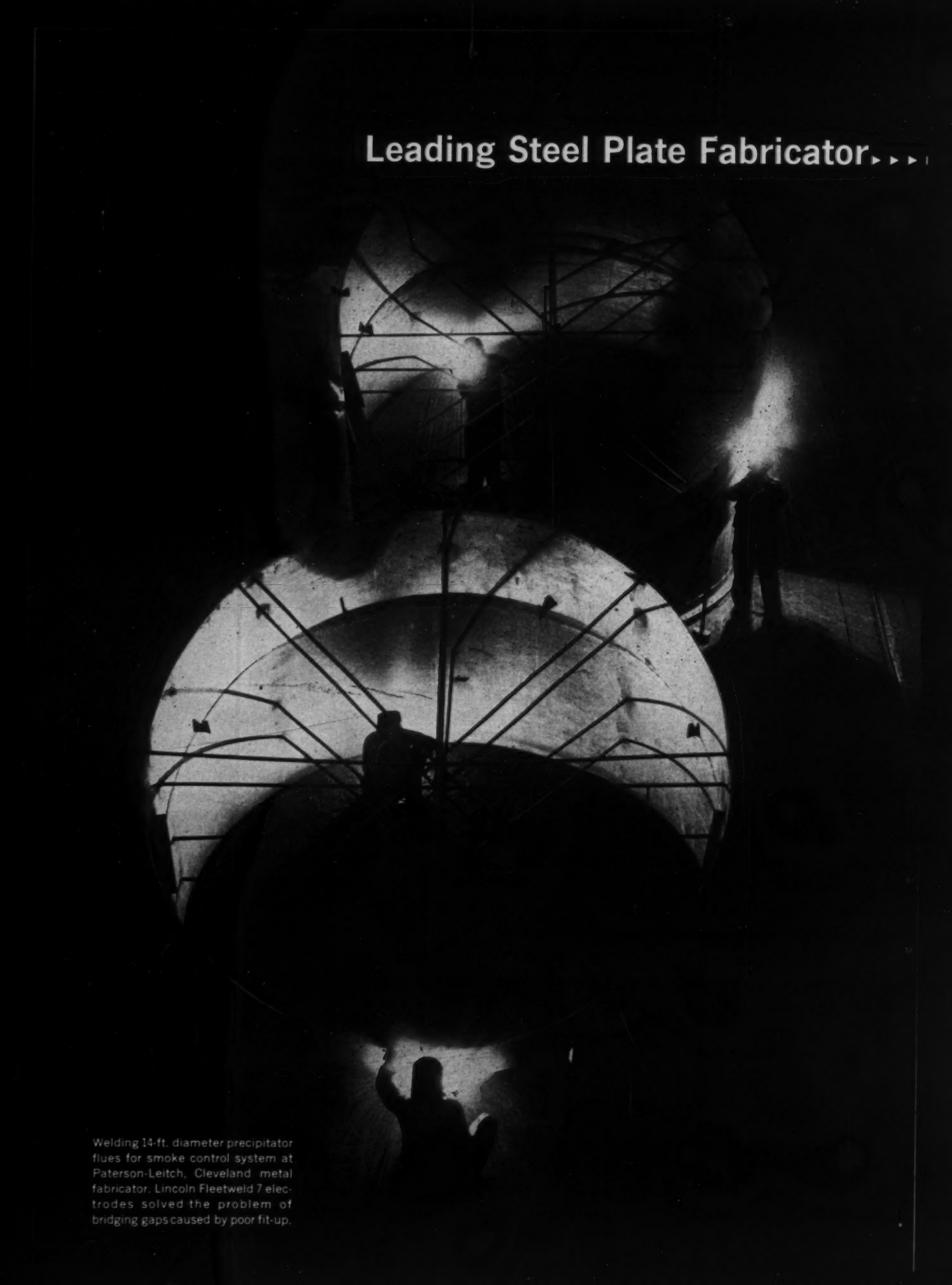
Adaptable for automatic cycling.

Pneumatically or hydraulically operated wedge or toggle type jaws.

Hyde Park
FOUNDRY AND MACHINE CO.
HYDE PARK
Westmoreland County, Penna.

Rolls
Rolling Mill Equipment
Gray Iron Castings

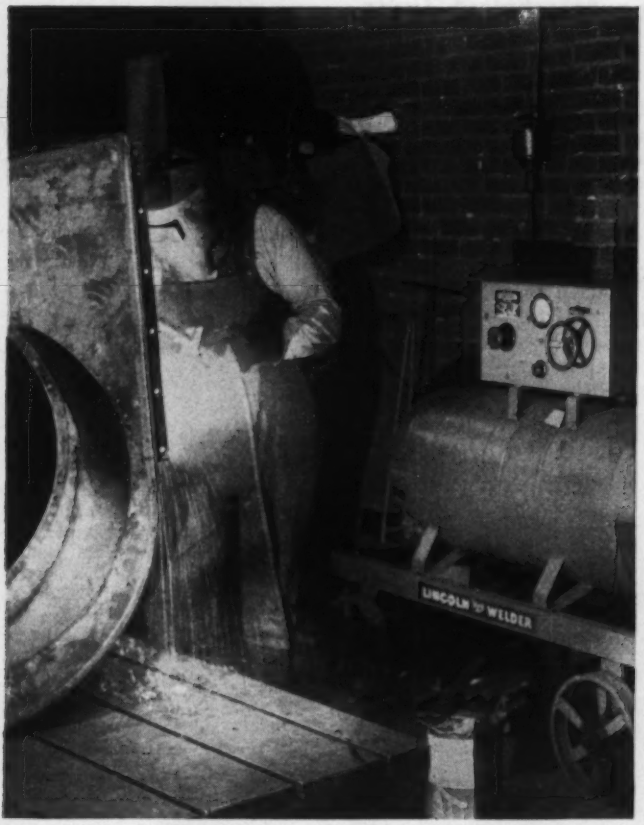
Leading Steel Plate Fabricator...



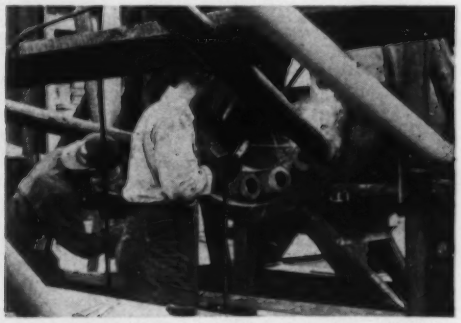
Welding 14-ft. diameter precipitator flues for smoke control system at Paterson-Leitch, Cleveland metal fabricator. Lincoln Fleetweld 7 electrodes solved the problem of bridging gaps caused by poor fit-up.

....ELIMINATES FIT-UP PROBLEM WITH LINCOLN FLEETWELD 7 ELECTRODE

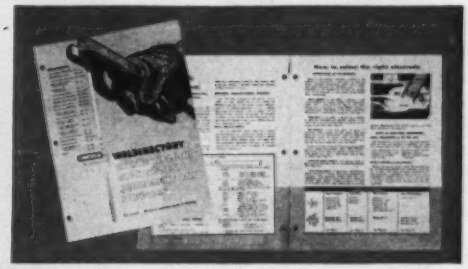
Fleetweld 7 is particularly suited to jobs with poor fit-up. Fleetweld 7MP has iron powder added to its coating to get still higher speeds, greater deposition rates. But, these are only two of a whole family of Lincoln Fleetweld electrodes for welding mild steel.



Here, Fleetweld 37 is used to weld fan blower housing. Its easy operation, fine appearance are important in all-position welding. Fleetweld 7MP, metal-powder brother to 7, is excellent where both speed and bead appearance are important.



Fleetweld 5, best-known electrode ever made is an all-purpose, all-position electrode, excellent for maintenance and general welding jobs. Another Fleetweld electrode, 5P, though generally similar to 5, was expressly designed to give the finest X-ray results on pipe. Fleetweld 35 is identical to 5 except it is for use with AC welders.



Each Lincoln electrode has been designed to do a particular job particularly well. Be sure you select the right one for your job. Call your local Lincoln welding specialist. No obligation, of course. Meanwhile, get your copy of the Lincoln Weldirectory, your guide to welding electrode selection. Write, The Lincoln Electric Company, Department 2941, Cleveland 17, Ohio.

LINCOLN ELECTRODES

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES

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Eastern Malleable Iron Co., Naugatuck

DELAWARE
Eastern Malleable Iron Co., Wilmington 99

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Chicago Malleable Castings Co., Chicago 43
Moline Iron Works, Moline
Moline Malleable Iron Co., St. Charles
National Mall. and Steel Castings Co., Cicero 50
Peoria Malleable Castings Co., Peoria 1
Wagner Castings Company, Decatur

INDIANA
Albion Malleable Iron Company, Muncie Division, Muncie
Link-Belt Company, Indianapolis 6
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MINNESOTA
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Mississippi Malleable Iron Co., Meridian

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Acme Steel & Mall. Iron Works, Buffalo 7
Frazer & Jones Company Division Eastern Malleable Iron Co., Solvay
Oriskany Malleable Iron Co., Inc., Oriskany
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Meadville Malleable Iron Co., Meadville
Pennsylvania Malleable Iron Corp., Lancaster

TEXAS
Texas Foundries, Inc., Lufkin

WEST VIRGINIA
West Virginia Mall. Iron Co., Point Pleasant

WISCONSIN
Belle City Malleable Iron Co., Racine
Chain Belt Company, Milwaukee 1
Federal Malleable Company, Inc., West Allis 14
Kirsh Foundry Inc., Beaver Dam
Lakeside Malleable Castings Co., Racine
Milwaukee Malleable & Grey Iron Works, Milwaukee 46

These companies are members of the Malleable Castings Council

NEW PRODUCTS and equipment

(*Continued from Page* 149)

tios: 8:1 for up to 6 hp at 225 rpm and 18:1 for up to 3.8 hp at 100 rpm. It consists of a double reduction speed reducer with packing gland and driveshaft which mounts on a trough end. Trough ends are also available. Any desired output speed may be obtained by selecting the correct V-belt drive to transmit power from the motor.

For further information, *write* Dodge Mfg. Corp., Mishawaka, Ind.

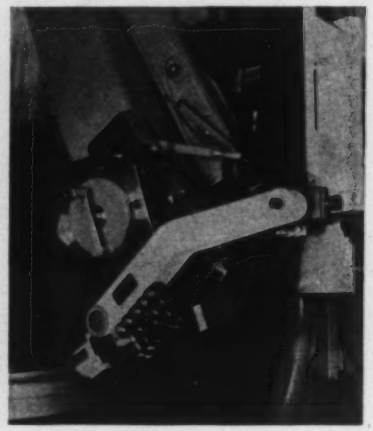
Tracing Attachment Turns VTLs into Contour Lathes

A UNIT called the Mark X tracing attachment converts vertical turning and boring machines (VTLs) into contour turning lathes.

The compact attachment mounts to the ram or turret of the machine or it may be installed in place of the side head, depending on the machine and job requirements. No machine conversion is required.

The machine may be used as a conventional vertical turning and boring machine by removing the attachment.

Contour OD and ID and facing operations are easily done with the hydraulically operated attachment.



The unit has a cylinder bore of 4 in., a stroke of 9 in., and a tracer stylus pressure of 9 to 12 in. Toolholders are available for ¾, 1, and 1¼ in. square tools.

For further information, *write* True-Trace Corp., 9830 Rush St., El Monte, Calif.

NEW literature

Write directly to the company for a copy

Nondestructive Tests

A technical bulletin contains a comprehensive listing of popular nondestructive testing methods and the applications best suited to each. Balteau Electric Corp., 5 New St., Stamford, Conn.

Titanium Missile Study

A 14 page booklet summarizes the six major application areas for titanium in missile construction. Also included is a brief discussion of the four titanium alloys of greatest significance to the missile builder. Cost data are given. Titanium Metals Corp. of America, 233 Broadway, New York 7, N. Y.

Gear Production Data

A data sheet illustrates typical gears and splines and suggests the best processing method for each, depending on high, medium, or low production requirements. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Effect of Surface Carbon

The exact relationship of surface carbon to fatigue life of bolts is explored in a special laboratory report. It singles out a relatively new method of hardness determination as the only reliable indicator. Box 579, Standard Pressed Steel Co., Jenkintown, Pa.

Material Handling

An eight page brochure defines GE's concept of automatic material control (AMC) and lists the benefits to be obtained from such systems. The close tie between automatic material handling and related data processing functions is illustrated. General Electric Co., Schenectady 5, N. Y.

Preheating, Stress Relief

Many of the questions about why, when, and what to preheat and stress relieve are answered in a 32 page, 16 section booklet. The information has been taken from various codes and handbooks on welding procedures from practical tests conducted to determine the results of various procedures, and from practical field procedures. Hobart Bros. Co., Troy, Ohio.

Rolling Worm Threads

A booklet, "Design ABCs of Rolled Worm Threads," illustrates and describes general rules and practices as well as design. Landis Machine Co., Waynesboro, Pa.

Alloys for Semiconductors

A series of four data sheets deals with the melting points of alloys most commonly used in the fabrication of semiconductor products. Semi-Alloys Inc., 550 S. Fulton Ave., Mt. Vernon, N. Y.

Malleable Puts More Muscle in Machinery

In the agricultural equipment field, reputations depend on building products that can take rough treatment . . . and give real value. To do it, agricultural equipment manufacturers rely heavily on Malleable iron castings.

Malleable's excellent ductility and shock resistance mean longer life and fewer problems than obtainable with fabrications. Low start-up cost for small quantities also is vitally important in this competitive industry.

Put more reputation-building quality into your products at less cost with Malleable. For design assistance or quotations, call any company that displays this symbol —

PROBLEM-SOLVING IDEAS are yours free in Data Unit No. 115. For your copy, ask any member of the Malleable Castings Council, or write to Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio.

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The versatility of Malleable castings is reflected in the variety of ferritic and pearlitic Malleable tractor parts, from the tough, dependable front axle bar to bolsters, lift arms, clamps, clevises, hitches, hinges, foot pedals, transmission planetary carriers and clutch parts.

TOCCO
Induction Heating Anneals Pipe Welds ...In the Welding Line

Page Hersey Tubes Ltd., Toronto, Ontario, is one of several progressive manufacturers using Tocco induction heating to continuously anneal welds in electric seam-welded 4" diameter and larger pipe to improve ductility and toughness.

The Tocco engineered and built post-weld stations are installed in the line following the welding station. Special Tocco developed inductors, powered by two Tocco high frequency generators, heat the weld affected area on pipe up to 8" diameter 3/8" wall to 1700°F at mill speeds. Annealing is accomplished with no extra handling of the pipe and with metallurgical results at the weld area not possible by any other method. The cost is only a fraction of what it would be if the entire pipe were heated in a furnace.

This is typical of the scope and ability of Tocco's engineering staff to solve metal heating problems with induction heating. If your manufacturing operations require heating metal for forging, heat treating, melting, brazing or soldering, it will pay you to check with Tocco for the latest and most effective methods for increasing production and cutting costs.

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Please send copy of "Typical Results of Induction Annealing"

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Second Quarter Output: Up 20%

LOOK for second quarter steel ingot production to be at least 20 per cent higher than the first quarter's output.

A few weeks ago, market analysts expected a gain of only 10 to 12 per cent. They've doubled their estimate because of a strong pickup in automotive demand and steady gains in other markets. Most of the experts queried by STEEL believe second quarter production will reach 23.6 million tons (vs. 19.7 million in the first quarter). A few think April-June output will go as high as 24.6 million tons—25 per cent more than the industry poured in the first three months.

AUTOMAKERS PUSHING—Because cars and trucks are selling better, automakers are stepping up their schedules and ordering more steel: Ford Motor Co. has upped its second quarter program for the third time in six weeks. It plans to build 496,000 cars—51 per cent more than it assembled in the first quarter of this year and 3 per cent more than it made in the second quarter of 1960. White Motor Co. is increasing truck production at its Cleveland plant for the third time this year.

STEELMAKERS BENEFIT—Since automakers have kept their steel inventories attuned to production at a low level, they haven't been able to boost their schedules without placing new orders and requesting early delivery of tonnage previously ordered. The impact on order books of Midwestern mills has been substantial. One big producer booked more tonnage in the last week of April than it had received in any week since April, 1960. It's producing hot rolled and cold rolled sheets at the highest level since last June.

OUTLOOK BRIGHTENS—Steelmakers don't expect 1961 to be a standout year for cars but they're more optimistic than they were a few months ago. Marketing men at one big steel company have bumped their forecast of calendar 1961 auto production from 5.3 million to 5.5 million cars (vs. 6.7 million last year).

JUNE PROSPECTS CLOUDED—Because of the strong demand from automakers and some rebuilding of steel inventories at the mill level, May production of ingots will be close to 8.3 million tons—about 10 per cent higher than last month's. It's hard to tell whether the uptrend will continue in June. Automotive buying is the big unknown and the most important factor. There's bound to be a dead month (when automakers are running out the last of their 1961 models) between now and August, and some mills think it may come as early as June. If it does and if there's a cutback in automotive demand, June steel production may fall below 8 million tons.

OTHER SUPPORT LACKING—There probably won't be enough new strength in other markets to take up the slack. Higher construction demand will be offset partly by falling of orders from farm machinery builders (they're past their peak already). Tin plate shipments may be larger in June than usual (because can companies are operating on abnormally low inventories) but only a moderate pickup is expected in the appliance industry's demand for sheets. Oil country goods, standard pipe, and bars will merely hold their own.

PRODUCTION GAINS—Look for ingot output in the week ending May 13 to exceed the 1.9 million tons that STEEL estimates the industry poured in the week ended May 6. Output then was up 2.3 per cent from the previous week's and the largest of any week since the one ended May 21, 1960.

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*Current prices were published in the May 1 issue and will appear in subsequent issues.

NEW

3-way bed lathe offers 4 big advantages

With this new Farrel-Betts design, *there is more rigid support of the tool* because the cutting-force resultant falls between the front and middle ways.

There is more rigid support of the work because it is not necessary to extend the tailstock quill, to reach across the carriage bridge, in facing the end of the workpiece. The carriage will pass completely by the tailstock.

The ability of the carriage to pass the tailstock, as well as the steadyrests, also results in *less setup time*. This is particularly effective when two carriages are used on long lathes.

From the carriage, the operator has finger-tip, *centralized control* of all operations.

The carriage is arranged for application of numerical and/or tracer control and electric thread cutting. The new "Rotorak" feed incorporates a sectional threaded rack with a pair of large, adjustable screws for backlash control. As the rack sections are short and accurately spaced, there is no limit to the length of bed that can be supplied. The new carriage feed system eliminates the need for a lead screw, rods, shifter mechanisms, etc. Result — A cleaner machine, less maintenance and less operator distraction.

These outstanding new lathes are made in sizes ranging from 32" to 92" swing over the bedway. Write, wire or phone for answers to any questions you may have.

FARREL-BIRMINGHAM COMPANY, INC.
CONSOLIDATED MACHINE TOOL DIVISION
565 Blossom Road, Rochester 10, New York
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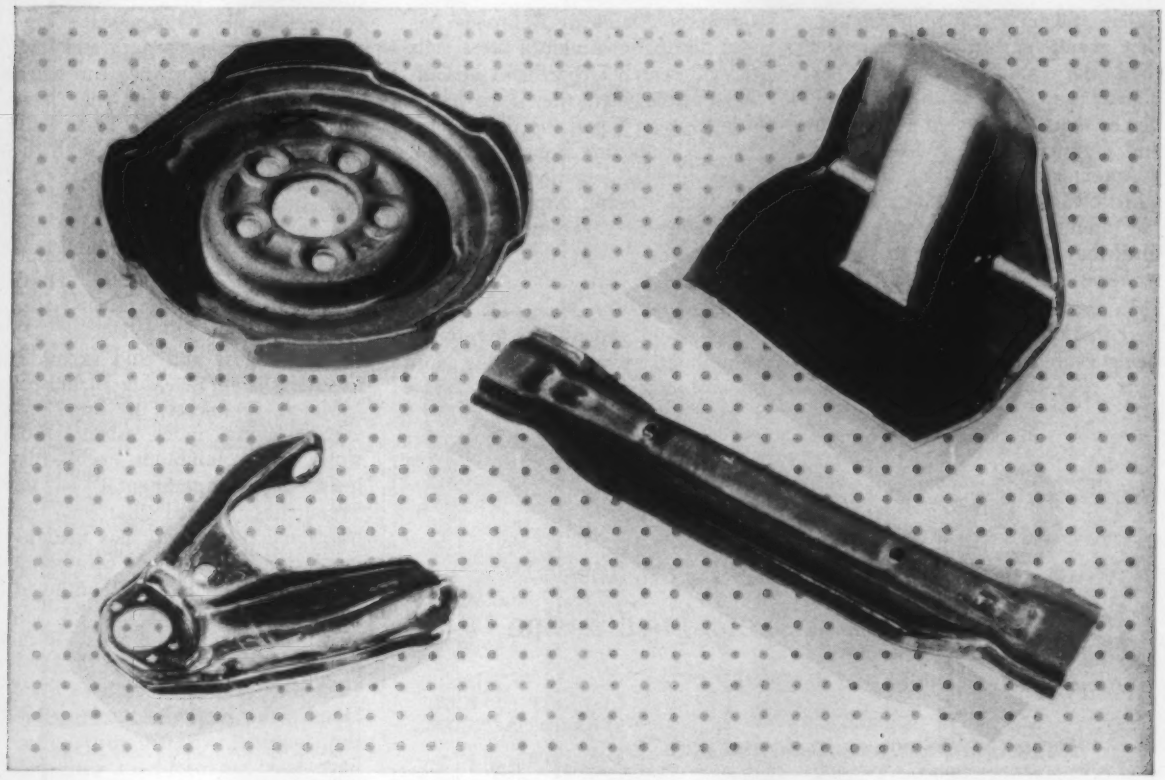
FARREL
BETTS

CM-64



Cold formability of stampings like these is one reason . . .

Columbium Steels Are Gaining Fast

BORN only three years ago, columbium steels are proving their worth and winning acceptance in markets of vast potential.

Within a year or two, ingot production may be 100 times the 5000 tons that were poured in 1958. By 1970, annual output may be well over 2 million tons. Producers have technical problems to solve and competitive battles to win, but they're sure of one thing: Their sales pitch has plenty of appeal.

• **Selling Points** — They're telling prospective users that the addition of 0.01 to 0.02 per cent columbium as ferrocolumbium to a ladle or ingot mold of mild carbon steel: 1. Increases its strength. 2. Preserves weldability at the higher strength level. 3. Provides good formability. 4. Provides toughness that is equal to, or better than, that of mild carbon steel.

What's more, they say, you can get added strength in the as-rolled condition and thus eliminate heat treating. And even though you pay $14 to $21 a ton more for columbium treated steels than for straight carbon grades, you save money because higher strengths permit use of lighter gages and thinner sections.

• **Ups Yield Strength**—By one metallurgist's estimate, adding 0.02 per cent columbium to an 0.20 carbon, 1.10 manganese plate 1/4 in. thick would boost its yield strength from 40,000 psi to 55,000 or 60,000 psi. Where strength requirements are increasing, columbium treated steels are being specified more frequently.

Take earth moving machinery. Caterpillar Tractor Co., Peoria, Ill., is using semikilled columbium plates up to 3/8 in. thick in places where it formerly used fully killed, medium manganese grades. "We're getting equivalent physical properties at lower prices," says T. H. Spencer, quality control manager. "We're using columbium steel with a yield strength of 50,000 psi in places where we want resistance to deformation and denting. We've found no drawbacks in the forming, welding, or impact properties of steel up to 3/8 in. thick. Because of the trend toward bigger, more powerful equipment, we're going to need larger tonnages of steels that reduce weight, increase payload, and permit us to quote a low price per yard for moving material."

• **Winning Acceptance**—Columbium steels are also being used in construction equipment, trucks and trailers, pressure vessels, propane cylinders, line pipe, and lading devices on railroad cars. Truck builders are considering them for

frames and cross members; although they would cost more per pound than the carbon steels they replaced, they could be used in thinner sections that would cut weight and permit greater payloads.

Automakers are experimenting with columbium treated bumpers but aren't likely to specify them until they solve problems of surface, stretcher strain, and grain size.

In another part of the transportation market, columbium steels are being evaluated for possible use in rails. For the last year, the Association of American Railroads has been testing columbium steel rails in its Research Department at Chicago. This year, they'll be tested in service on Great Northern Railway Co.'s ore line from the Mesabi Range to Lake Superior. It's hoped they'll have better impact values at low temperatures than rails now being used.

• **Line Pipe Promising**—Of all the present and potential markets for columbium steel, none looks more promising than line pipe. Gas transmission companies want pipe with higher yield strength and lower notch ductility so they can avoid line breaks of the type that have plagued them recently. They want a 60,000 psi yield material with the weldability of the American Petroleum Institute's Type X-52 (52,000 psi) carbon manganese steel. And they hope to get it at a price below that of API Type X-60. That's where the columbium steels come in. They can be rolled at API yield strengths and cold expanded to strengths approaching 70,000 psi.

Major producers of line pipe aren't saying much about their work with columbium steels—they insist it's "experimental" — but STEEL has learned that one gas transmission company has installed more than 50 miles of columbium treated line pipe in the Southwest. Sizes being tested are 20, 24, and 30 in. diameters, with most of the mileage in the 20 in. size. About 7500 tons of pipe have been used. Despite the high yield strength of the material (65,000 psi), there have been no problems with field bending or welding.

• **Needed: More Experience**—You can order columbium steel in hot rolled, cold rolled, and galvanized sheets, hot rolled bars, plates up to ⅜ in. thick, small shapes, and light structurals. Changes in mill equipment and practice are considered necessary before gages above ⅜ in. become commercially available.

In all gages, production controls must be precise or the columbium will go to the grain boundaries, lowering impact values. To maintain uniformity of strength and hardness, producers soak ingots at a minimum of 2300° F, roll slabs between 1600 and 1750° F, and cool rapidly with special spraying equipment.

Says one producer: "We can't make the steel tough enough above ⅜ in. thick in the semikilled condition. The grain size is too coarse. The trouble with killing is that there's a 10 per cent loss of yield."

The columbium steels may eventually bridge the gap between the 60,000 and 90,000 psi steels, producers believe. But to attain yield strengths of 75,000 psi, they'll require adjustments—killing, higher manganese, and addition of silicon.

Stamco has a new, compact and streamlined design

...Rated 3 cuts of 3/16" mild steel.

Important advances in design and material make this unit the finest at the lowest possible cost.

Stamco is proud to announce the "All Purpose" Slitting and Coiling line. Years of engineering study have resulted in the development of this outstanding slitting equipment. These years of research are reflected in unusual features of this line.

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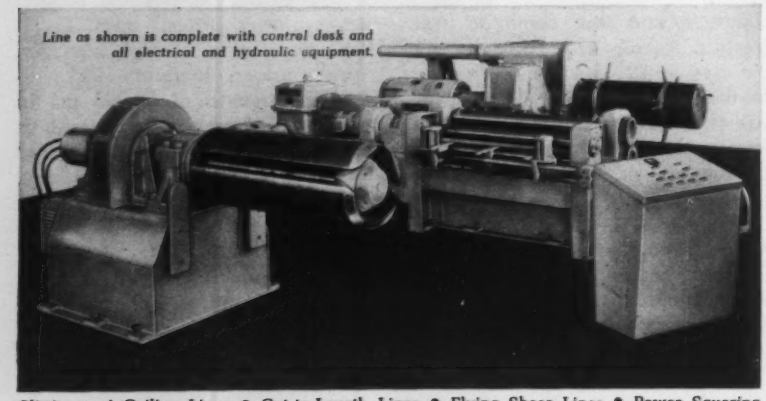


Line as shown is complete with control desk and all electrical and hydraulic equipment.

Slitting and Coiling Lines • Cut-to-Length Lines • Flying Shear Lines • Power Squaring Shears • Continuous Process Lines • Ferrous & Non-ferrous Mill Equipment

Stamco, Inc.
New Bremen, Ohio, U.S.A

Tubular Goods . . .

Tubular Goods Prices, Page 171

While there is some improvement in demand for buttweld pipe, the gain has not been stimulated by the seasonal pickup in construction as much as other building steel products. One reason given by sellers: Continued heavy imports. They are said to account for at least 30 per cent of domestic consumption.

Oil country tubular goods are not moving as well as had been expected. That's explained by the continued sluggish operations in the petroleum industry and excessive supplies of crude oil and refined products.

A total of 1778 rotary oil drilling rigs were in operation in the U. S. and Canada in the latest week of record, reports the Hughes Tool Co. The U. S. had 1691 rigs operating, up 53 from the preceding week; Canada had 87 engaged, up four.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 168 & 169

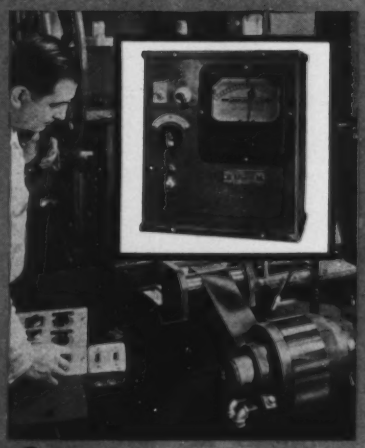
Sheet steel demand is assuming new vigor. Significantly, the automakers once again are asking for larger shipments, and users generally are ordering more freely. Tonnages are larger, and there is a little more forward ordering. However, since the mills can still make prompt shipments, buyers are under little pressure to build inventories.

Operations of a major Pittsburgh area steelmaker whose product mix is about 50 per cent sheets and strip reflect the improvement in demand. Last week, the producer poured ingots at 100 per cent of the average weekly output during the 1957-59 base period. Its index of production was 75 in January, 80 in February, and 85 in March. Despite an increase in shipments during April, its backlog of unshipped orders on May 1 was about 30 per cent above the low point during the recession.

Shipments of smaller producers, also heavily involved in sheets and strip, showed an 11 per cent gain in April. Additional gains of 10 to 12 per cent are indicated this month, and the rise is expected to continue through June.

The renewed interest of the automakers is reflected by requests to Midwestern mills for May tonnage

CONTEMPLATE SOMERS THIN STRIP FIRST



Somers THIN STRIP provides the most durable, dependable material for a wide range of electronic, electrical, aircraft, missile and many other applications.

For accuracy in dimension, physical and chemical properties on metal from .010" to .000125 thin (nickel alloys from .020"), consult Somers — over 50 years the number one source.

Brass	Stainless Steel
Copper	Phosphor Bronze
Nickel	High Temperature Metals
Monel	Beryllium Copper
Inconel	Glass Sealing Alloy
Inconel X	Tin Coated Metals
Nickel Silver	and Rare Metals

Write for confidential analysis of your specific requirements — no obligation, of course.

Somers THIN STRIP

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Phone (Area Code — 203) Plaza 6-8321 TWX-WBY77

To Keller Manufacturing Co., Inc., it means a savings of nearly $50 a day in finishing costs on leaf rakes. And, theirs is a comparatively small plant operation.

Before moving into their new plant, this St. Louis manufacturer of Sweep-Easy lawn and garden tools investigated and tried out various finishing equipment. They chose Ransburg No. 2 Process to do the job because they found that only the Ransburg Electrostatic Hand Gun could give them the desirable increase in production—with improved quality—and at lower cost.

PRODUCTION IS NEARLY DOUBLED
QUALITY OF FINISH IS IMPROVED

With the Ransburg Hand Gun, Keller's daily painting prodution of leaf rakes nearly doubled what they were formerly getting with air hand spray. And, where they used to get only 168 rakes per gallon of paint, they now get 426 per gallon—over 2½ times as many—actually *an increase of over* 150% *in paint mileage.* With the unique "wrap-around" feature, electrostatic is improving the quality, providing a complete, uniform coating over all areas—even on the tine edges.

NO REASON WHY YOU CAN'T DO IT, TOO!

See how the Ransburg Electrostatic Hand Gun can save time . . . paint . . . and cut costs in YOUR finishing department. Or, if your production justifies, it'll pay you to investigate Ransburg's automatic electrostatic spray painting equipment. Write for our No. 2 Process brochure which shows numerous examples of modern production painting in both large and small plants.

RANSBURG

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shipments as quickly as possible. The turnaround in auto demand affects a wide range of products—but chiefly hot and cold rolled sheets.

Steel Bars . . .

Bar Prices, Page 167

While there were two fewer shipping days in April than in March, a leading producer of cold finished steel bars reports shipments in the month equaled those of the preceding month. "We can't complain about that," a company spokesman said, "because March shipments were up substantially from February's and were the best we had in a long time."

Sales are better across the board, with all customers stepping up their orders. In the main, the upturn reflects rising consumption and the tapering off of inventory liquidation. Since buyers aren't showing any inclination to order farther ahead, barmakers won't know until late this month whether they'll ship as much steel in May as they did in April. They're hoping to do a little better—if only because May is a longer month.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 168

Rising construction activity is reflected in soaring demand for reinforcing steel of various classifications. Rebars are being turned out in larger volume, and shipments are still available in two to three weeks. However, mill order backlogs are building up, and indications are the mills will be operating close to capacity most of the summer.

More than 2000 tons of reinforcing bars were placed with mills in the Pacific Northwest last week. Several sizable jobs are pending in that district, including Oregon highway construction. Washington State opened bids recently for highway projects involving more than 500 tons of bars. Similar tonnage is pending for Idaho road work.

Foreign prices on reinforcing bars have dropped $4 a ton since January in the Houston market. There has been a $2 a ton reduction since Apr. 1. A major distributor attributed the decline to the ban on use of foreign steel in highway construction in the Southwest. Importers are testing the ban in the

courts, but their recent bid for a temporary injunction was unsuccessful.

Road mesh is not moving as well as reinforcing bars, but it's still a little early for demand to develop in volume.

Southwest Steel Imports Rise Sharply in March

Steel imports through the Port of Houston showed a marked increase in March, totaling 38,500 tons vs. 21,000 in February and 29,000 in January.

Of the total, 26,000 tons came from Belgium, 4000 from Japan, and 4000 from France; minor shipments were from other countries.

Iron-Steel Exports Rise As Imports Show Decline

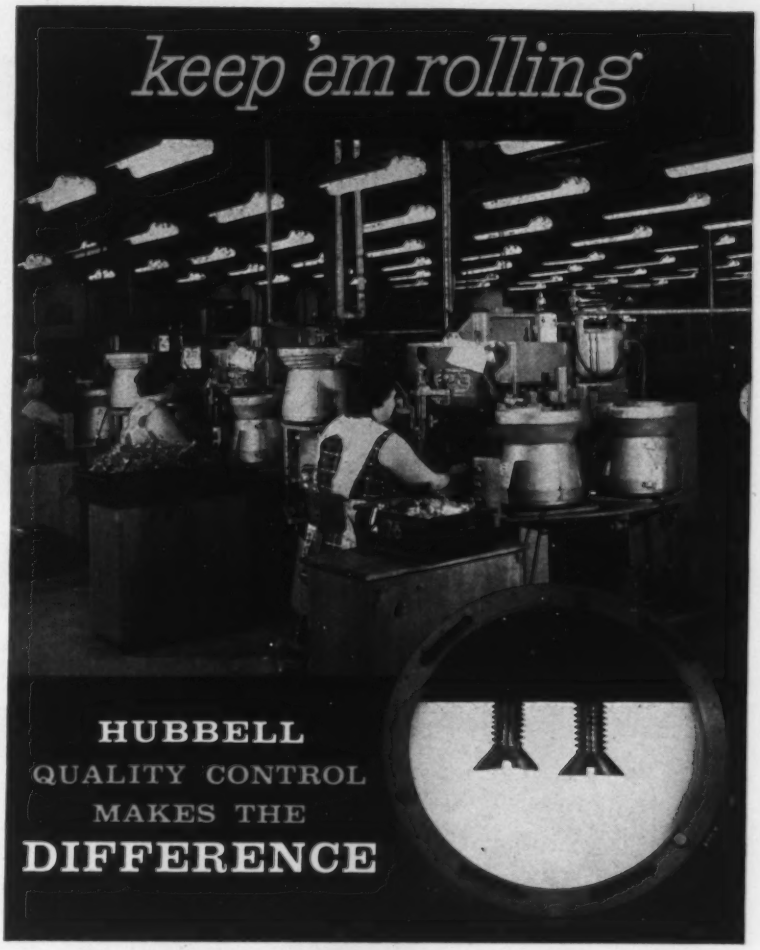
Exports of steel mill products in February totaled 147,108 net tons, valued at $31,556,142, reports the American Iron & Steel Institute. That compares with 132,383 tons, valued at $30,040,053, exported in January and 167,527 tons, valued at $35,806,791, moved in February a year ago.

The total for the first two months this year was 279,491 tons (value, $61,596,195) vs. 325,135 tons (worth $69,905,438) in the same period last year.

February exports of all iron and steel products (including fabricated items, pig iron, ferroalloys, and soil pipe) amounted to 778,960 tons, valued at $25,745,515. That compared with 458,713 tons, worth $16,807,150, in February, 1960. The total for the first two months of the year was 1,347,339 tons, valued at $43,534,372, vs. 814,733 tons, valued at $29,615,337, in the same 1960 period.

Imports of steel mill products in February were 152,452 tons, valued at $20,904,986. That compared with 467,759 tons, valued at $62,974,055, in February, 1960. The total for the first two months this year was 297,658 tons, valued at $40,829,791, vs. 931,035 tons, valued at $126,039,760, in the same period last year.

Imports of all iron and steel products (including fabricated items, pig iron, ferroalloys, and castings) in February amounted to 183,339 tons,



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Hubbell precision fasteners are your best insurance against production snafus like this, because they are quality controlled at every step of manufacture to provide as uniformly perfect cold headed products as is humanly possible. It's our job to weed out the duds like the one at left in the viewmaster above, and supply uniformly perfect fasteners like the Hubbell one at right.

Contrast the two. Note how the Hubbell fastener at right is completely free of burrs or dirt that might jam an automatic machine. Also see how sharp and clean the threads are, and how deep and precise the slot. All these things add up to faster production, less down time, fewer rejects and a better end product.

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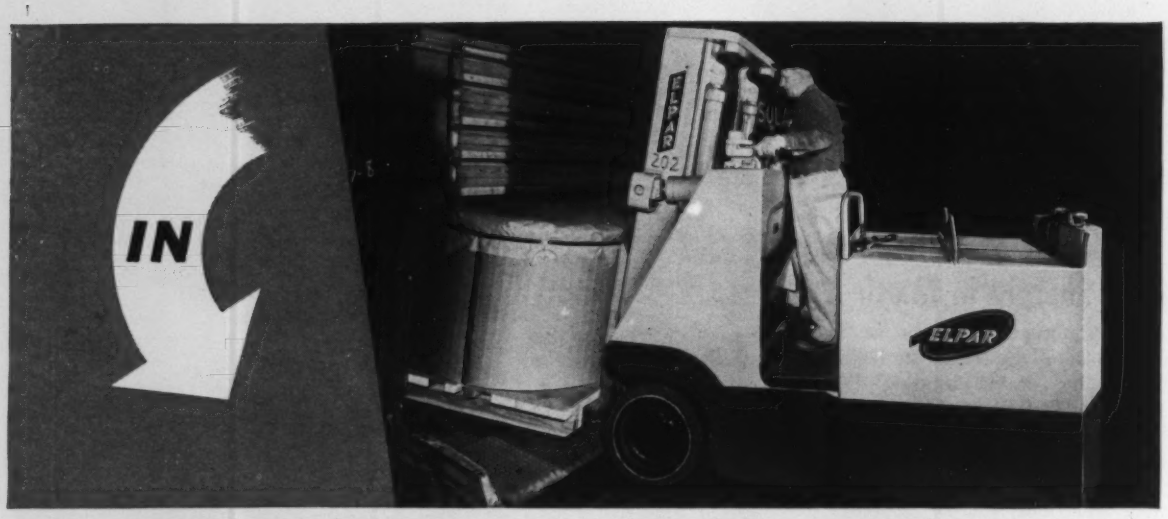

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valued at $27,814,206. That compared with 511,770 tons, valued at $73,435,706, in the same period a year ago. The total for the first two months this year was 358,180 tons, valued at $54,696,327, vs. 1,030,142 tons, valued at $147,127,-571, in the same two months of 1960.

Refractories . . .

Refractories Prices, Page 173

Prices have been reduced $7 per thousand pieces on high duty and semisilica brick, 9 in. sizes, by Harbison-Walker Refractories Co., Pittsburgh. Sizes other than 9 in. and special shapes are not involved.

The company states the action was taken to achieve a more competitive position in the market, which has been marked by some price cutting lately. Other producers indicate they'll make similar formal reductions

Wire . . .

Wire Prices, Pages 169 & 170

Some pickup in demand for manufacturers' wire is reported, largely reflecting releases from the automotive industry. More springs for car cushions are needed. Some wire mills are operating at 65 to 70 per cent, but the average for the industry is lower.

West Coast wire sellers report their bookings in April were off somewhat. Indications are, however, consumers in the area are doing some stockpiling. Competition from imports continues severe, but it's expected to subside as books of foreign suppliers fill up.

Distributors . . .

Prices, Page 172

Bookings by steel service centers have increased gradually in most districts, but the seasonal upturn is below expectations. Based on the rise in demand for steel recorded by mills, distributors are confident that they will start receiving a larger share of the business soon.

Practically all categories of consuming industries are increasing their inquiries—including the automotive, appliance, and construction industries, which have comparatively low inventories. Stocks held by distributors are well balanced and ample to cover all nearby needs.

Plates . . .

Plate Prices, Page 167

Although plates are in a little stronger demand, mill backlogs continue limited, and shipments of universal plates are still available in one to two weeks, sheared plates, in two to three weeks.

Fabricators in the Pacific Northwest are awaiting a decision by Aberdeen, Wash., on tenders for 7 miles of 28 in. water supply pipe. Bids under consideration are $560,-611 for welded steel and $547,579 for concrete cylinder pipe. About 1400 tons of plates are involved.

Tool Steel . . .

Tool Steel Prices, Page 171

"We feel that we hit bottom last November," says a producer of tool, die, and specialty steels in the Pittsburgh district. "We've had a steady pick up since then.

"There hasn't been any big spurt, but each month's orders have been a little higher than the previous month's. We're looking for the improvement to continue through June—followed by a seasonal decline in the third quarter."

Pig Iron . . .

Pig Iron Prices, Page 172

Imports of pig iron in February totaled 1195 net tons, bringing the total for the first two months of the year to 6150 tons. Imports in all of 1960 amounted to 330,847 tons. In February, tonnage was received from: Union of South Africa 746; Australia 224; West Germany 166; Canada 59.

Pig iron exports in February amounted to 14,575 tons, bringing the total for the first two months of the year to 61,453 tons. The movement in all of 1960 amounted to 111,773 tons. Of the total shipments in the first two months this year, Japan took 40,549 tons, Italy 20,830.

With demand for merchant iron showing only a moderate seasonal improvement, the big push in the pig iron market is coming from steelmakers. The recent fast upswing in steel ingot production has put pressure on blast furnace operators to furnish more hot metal.

The No. 1 blast furnace at the Steubenville (Ohio) Works of Wheeling Steel Corp. went back

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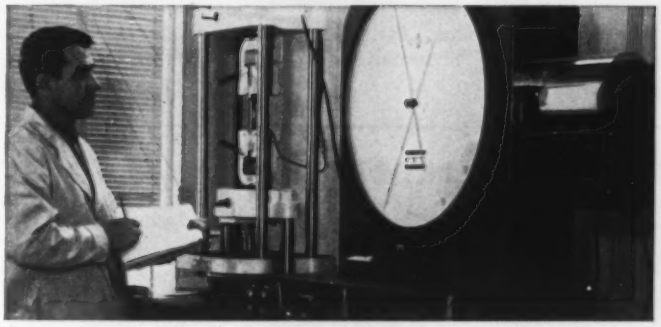

To continue with Ulbrich's policy of constantly giving customers more and better service Ulbrich has installed a fully equipped laboratory. After conversion of steel stocks to customer requirements, physical properties are checked on such equipment as a Tinius Olsen Tensile Machine, pictured above. Bend Test equipment, Rockwell Testers, a Kentron Micro-Hardness Tester and a complete chemical department supply time saving, accurate analysis and Quality Stainless Steel to *exact* customer specifications.

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Rise in Steel Output Gains Momentum

STEEL INGOT production is gaining momentum faster than it decelerated a year ago. Although production through Apr. 29 is 38.2 per cent under the total for the like period in 1960, the weekly production rate is expected to exceed that of a year ago by the end of this month.

● **Buffalo**—Production is up sharply here. Bethlehem Steel Co. has reactivated five open hearth furnaces, putting 24 of the Lackawanna mill's 35 into operation. Wickwire Spencer Div., Colorado Fuel & Iron Corp., took one furnace out of production for a repair job that will require about one week. Those moves resulted in a district gain of more than 12 points—to an estimated 68.5 per cent of capacity (based on 1960 ratings).

● **Chicago**—The local steelmaking rate for the week ended May 6 is estimated at 71 per cent of 1960 capacity, a gain of 3 points over the previous week. Major mills continue to reactivate idle furnaces. U. S. Steel Corp. is operating 15 of 31 open hearths at South (Chicago) Works, a gain of four for the week ended May 6.

● **Detroit** — Two mills here relighted more furnaces during the week ended May 6. One of the larger mills says it will be running at near capacity the rest of the year.

● **Youngstown**—The steel operating rate is holding steady. The outlook is for some improvement soon because volume orders from a variety of sources continue to increase—including automotive, appliance, construction, and pipe line industries.

● **Cleveland**—Production here has increased for seven consecutive weeks; it's the highest it has been since June, 1960. Jones & Laughlin Steel Corp. placed three more steelmaking furnaces (one open hearth and two electrics) into operation during the week ended May 6. The company is operating eight furnaces out of 13—vs. only two during the low point earlier in the year.

● **Pittsburgh**—In this district, J&L is operating all the furnaces (ten) at its Aliquippa (Pa.) Works. Wheeling Steel Corp. has placed ten open hearth furnaces in production since the week of Apr. 16 at its Steubenville (Ohio) Works, raising operations to the highest level since June, 1960.

● **Birmingham**—Steelmaking operations held fairly steady here during the week ended May 6. Production was held down by a labor dispute at the close of the preceding week (ended Apr. 29). It involved a discharged worker in the blooming mill at the Gadsden Works of Republic Steel Corp. The "unauthorized work stoppage" was quickly ended.

● **Los Angeles**—The Western District operating rate edged up slightly (to 75.5 per cent of 1960 capacity). The Fontana, Calif., Works of Kaiser Corp. increased its operations nearly 2 per cent.

● **Cincinnati**—The gradual pickup in steel operating rates continues. Production for the week ended May 6 is estimated at 77,895 tons, equivalent to a rate of 68 per cent of last year's capacity. At least one open hearth was relighted. An increase in orders from the automotive industry is cited as the impetus for the climb in steelmaking.

Pig Iron . . .

(*Concluded from Page* 163)

into production Apr. 29. Four of five blast furnaces at the plant are active. A $4.7 million project involving the No. 1 blast furnace (it was rebuilt and its capacity increased) has been completed. One of the major installations was a 110,000 cfm turboblower.

U. S. Steel Corp. started up its No. 5 blast furnace at the South (Chicago) Works last week—five of 11 iron making units are now active.

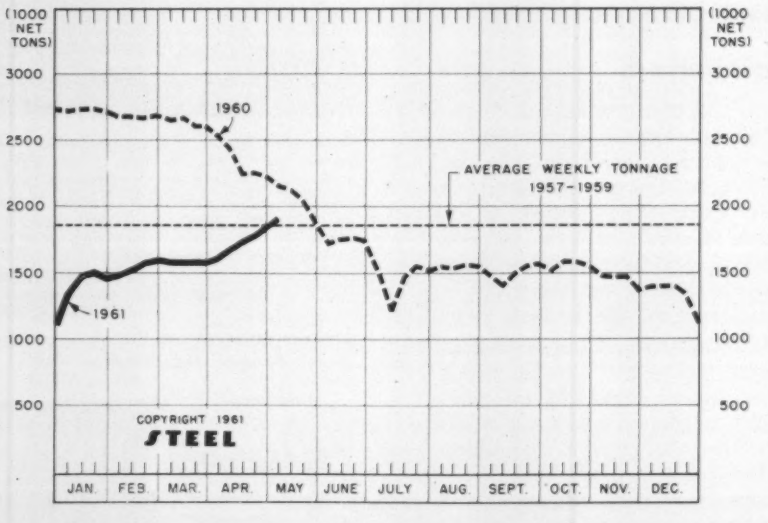
Bethlehem Steel Co. relit a blast furnace at its Lackawanna, N. Y., plant, making five of seven units active.

STEEL INGOT PRODUCTION

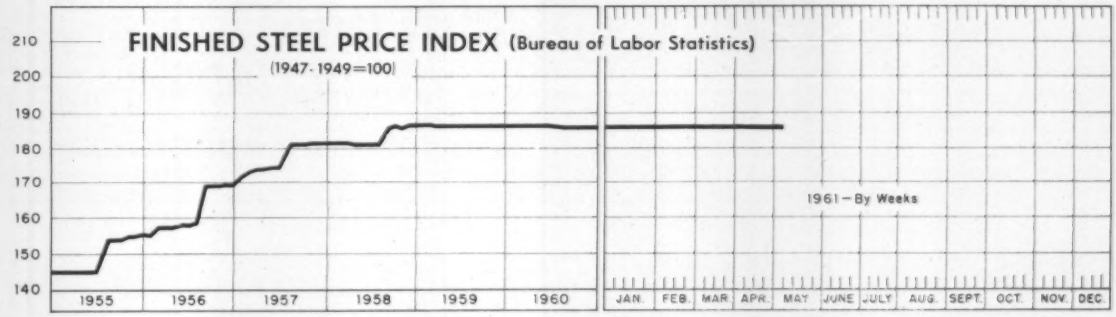
Weeks Ended	Net Tons	Change
May 6	1,900,000*	+ 2.3%
Apr. 29	1,858,000	+ 4.1%
Apr. 22	1,784,000	+ 2.1%
Totals to Apr. 29		
1961	27,044,000	−32.0%
1960	43,740,000	

DISTRICTS	Week Ended Apr. 29 Tons‡	Index†	Week Ended Apr. 22 Index†
Northeastern	275,212	103	101
Buffalo	97,355	100	92
Pittsburgh	363,194	90	87
Youngstown	142,784	84	78
Cleveland	97,225	105	95
Detroit	118,556	113	107
Chicago	381,558	102	97
Cincinnati	77,667	103	98
St. Louis	59,382	113	105
Southern	101,892	94	104
Western	141,465	121	116
Industry	1,858,000	99.7	95.8

*Estimated by STEEL.
†1957-59 (1,862,933 tons) = 100.
‡District tonnages are approximate and will not necessarily add to the national total.



Price Indexes and Composites



May 2, 1961	Week Ago	Month Ago	Apr. Index	Year Ago
186.1	186.1	186.1	186.1	186.8

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended May 2

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.825	Bars, H.R., Carbon	6.675
Rails, Light, 40 lb	7.292	Bars, Reinforcing	6.335
Tie Plates	6.875	Bars, C.F., Carbon	10.710
Axles, Railway	10.175	Bars, C.F., Alloy	14.125
Wheels, Freight Car, 33 in. (per wheel)	62.000	Bars, C.F., Stainless, 302 (lb)	0.570
Plates, Carbon	6.350	Sheets, H.R., Carbon	6.350
Structural Shapes	6.167	Sheets, C.R., Carbon	7.300
Bars, Tool Steel, Carbon (lb)	0.560	Sheets, Galvanized	8.775
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.680	Sheets, C.R., Stainless, 302 (lb)	0.658
Bars, Tool Steel, H.R. Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.060 (lb)	1.400	Sheets, Electrical	12.625
Bars, Tool Steel, H.R. Alloys, High Speed, W18 Cr 4, V 1 (lb)	1.895	Strip, C.R., Carbon	9.225
Bars, H.R., Alloy	10.775	Strip, C.R., Stainless, 430 (lb)	0.480
Bars, H.R., Stainless, 303 (lb)	0.543	Strip, H.R., Carbon	6.250
		Pipe, Black, Buttweld (100 ft)	19.495
		Pipe, Galv., Buttweld (100 ft)	23.098
		Pipe Line (100 ft)	195.430
		Casing, Oil Well, Carbon (100 ft)	201.080
		Casing, Oil Well, Alloy (100 ft)	315.213
		Tubes, Boiler (100 ft)	51.200
		Tubing, Mechanical, Carbon (100 ft)	27.005
		Tubing, Mechanical, Stainless, 304 (100 ft)	194.268
		Tin plate, Hot-dipped, 1.25 lb (95 lb base box)	10.100
		Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.800
		Black Plate, Canmaking Quality (95 lb base box)	7.900
		Wire, Drawn, Carbon	10.575
		Wire, Drawn, Stainless, 430 (lb)	0.665
		Bale Ties (Bundles)	7.647
		Nails, Wire, 8d Common	9.433
		Wire, Barbed (80-rod spool)	8.372
		Woven Wire Fence (20-rod roll)	20.910

STEEL's FINISHED STEEL PRICE INDEX

	May 3 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	247.82	247.82	247.82	247.82	210.45
Index in cents per lb	6.713	6.713	6.713	6.713	5.701

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT	$149.96	$149.96	$149.96	$149.96	$128.98
No. 2 Fdry, Pig Iron, GT	66.49	66.49	66.49	66.49	60.27
Basic Pig Iron, GT	65.99	65.99	65.99	65.99	59.80
Malleable Pig Iron, GT	67.27	67.27	67.27	67.27	61.27
Steelmaking Scrap, GT	37.00	37.33	39.67	33.33	55.00

Comparison of Prices

Comparative prices by districts in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	May 3 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.675	5.675	5.675	5.675	4.65
Bars, H.R., Chicago	5.675	5.675	5.675	5.675	4.65
Bars, H.R., deld., Philadelphia	5.98	5.98	5.98	5.975	4.93
Bars, C.R., Pittsburgh	7.65	7.65	7.65	7.65	6.25
Shapes, Std., Pittsburgh	5.50	5.50	5.50	5.50	4.60
Shapes, Std., Chicago	5.50	5.50	5.50	5.50	4.60
Shapes, deld., Philadelphia	5.745	5.745	5.745	5.77	5.00
Plates, Pittsburgh	5.30	5.30	5.30	5.30	4.50
Plates, Chicago	5.30	5.30	5.30	5.30	4.50
Plates, Coatesville, Pa.	5.30	5.30	5.30	5.30	4.80
Plates, Sparrows Point, Md.	5.30	5.30	5.30	5.30	4.50
Plates, Claymont, Del.	5.30	5.30	5.30	5.30	5.35
Sheets, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.325
Sheets, H.R., Chicago	5.10	5.10	5.10	5.10	4.325
Sheets, C.R., Pittsburgh	6.275	6.275	6.275	6.275	5.325
Sheets, C.R., Chicago	6.275	6.275	6.275	6.275	5.325
Sheets, C.R., Detroit	6.275	6.275	6.275	6.275	5.325-5.425
Sheets, Galv., Pittsburgh	6.875	6.875	6.875	6.875	5.85
Strip, H.R., Pittsburgh	5.10	5.10	5.10	5.10	4.325
Strip, H.R., Chicago	5.10	5.10	5.10	5.10	4.325
Strip, C.R., Pittsburgh	7.425	7.425	7.425	7.425	6.25
Strip, C.R., Chicago	7.425	7.425	7.425	7.425	6.25-6.35
Strip, C.R., Detroit	7.425	7.425	7.425	7.425	6.35
Wire, Basic, Pittsburgh	8.00	8.00	8.00	8.00	6.60
Nails, Wire, nonstock, Pitts.	8.95	8.95	8.95	8.95	7.60
Tin Plate (1.50 lb) box, Pitts.	$10.65	$10.65	$10.65	$10.65	$9.85

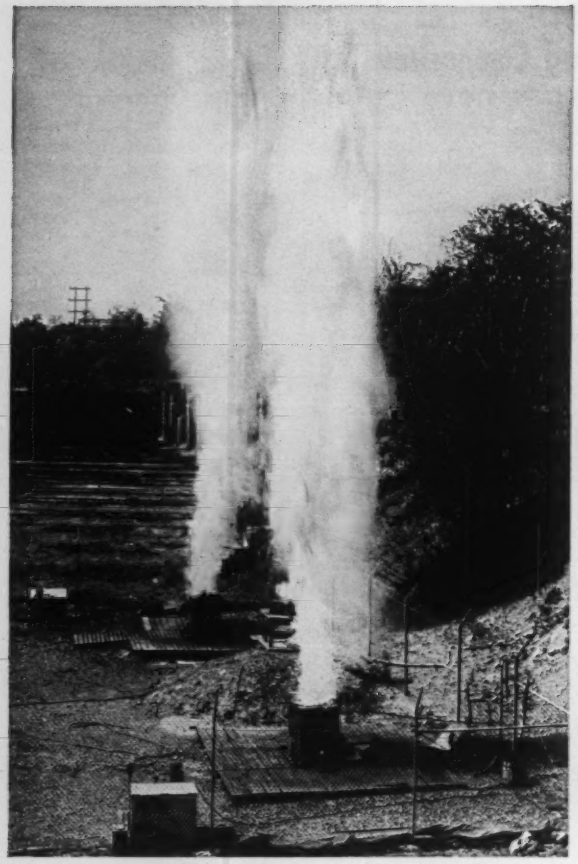
SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$99.50	$99.50	$99.50	$99.50	$84.50
Wire rods, 1/2-5/8" Pitts.	6.40	6.40	6.40	6.40	5.375

PIG IRON, Gross Ton	May 3 1961	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pittsburgh	$67.00	$67.00	$67.00	$67.00	$61.00
Basic, Valley	66.00	66.00	66.00	66.00	60.00
Basic, deld., Philadelphia	70.18	70.18	70.18	70.41	63.76
No. 2 Fdry, Neville Island, Pa.	66.50	66.50	66.50	66.50	60.50
No. 2 Fdry, Chicago	66.50	66.50	66.50	66.50	60.50
No. 2 Fdry, deld., Phila.	70.68	70.68	70.68	70.91	64.26
No. 2 Fdry, Birmingham	62.50	62.50	62.50	62.50	55.00
No. 2 Fdry (Birm.), deld., Cin.	70.20	70.20	70.20	70.20	62.70
Malleable, Valley	66.50	66.50	66.50	66.50	60.50
Malleable, Chicago	66.50	66.50	66.50	66.50	60.50
Ferromanganese, net tonst.	245.00	245.00	245.00	245.00	215.00

†74-76% Mn, Duquesne, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$34.50	$35.50	$36.50	$33.50	$53.50
No. 1 Heavy Melt, E. Pa.	40.00	40.00	43.00	35.00	57.00
No. 1 Heavy Melt, Chicago	36.50	36.50	39.50	31.50	54.50
No. 1 Heavy Melt, Valley	36.50	36.50	38.50	35.50	57.50
No. 1 Heavy Melt, Cleve.	33.50	33.50	35.50	32.50	54.50
No. 1 Heavy Melt, Buffalo	31.50	31.50	31.50	30.50	55.50
Rails, Rerolling, Chicago	57.50	59.50	61.50	52.50	72.50
No. 1 Cast, Chicago	42.50	43.50	44.50	42.50	52.50

COKE, Net Ton					
Beehive, Furn., Connlsvl.	$15.00	$15.00	$15.00	$15.00	$14.125
Beehive, Fdry., Connlsvl.	18.25	18.25	18.25	18.25	16.50
Oven, Fdry., Milwaukee	32.00	32.00	32.00	32.00	27.50



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Operator removing an outer warhead shell formed and shaped by explosives.

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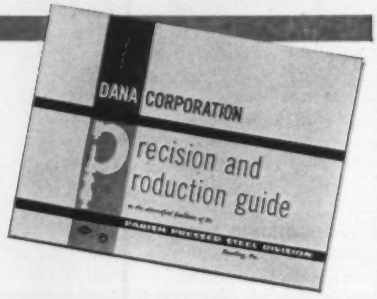


PARISH
PRESSED STEEL

DIVISION OF DANA CORPORATION • READING, PENNSYLVANIA

Steel Prices

Code number following mill point indicates producing company. Key to producers, page 168; footnotes, page 170. Mill prices as reported to STEEL, May 1, cents per pound except as otherwise noted. *Changes shown in italics.*

SEMIFINISHED

INGOTS, Carbon Forging (NT)

Munhall,Pa. U5 .....$76.00

INGOT, Alloy (NT)

Detroit S41 .....$82.00
Economy,Pa. B14 .....82.00
Farrell,Pa. S3 .....82.00
Lowellville,O. S3 .....82.00
Midland,Pa. C18 .....82.00
Munhall,Pa. U5 .....82.00
Sharon,Pa. S3 .....82.00

BILLETS, BLOOMS & SLABS Carbon Rerolling (NT)

Bartonville,Ill. K4 ....$82.00
Bessemer,Pa. U5 .....80.00
Buffalo R2 .....80.00
Clairton,Pa. U5 .....80.00
Ensley,Ala. T2 .....80.00
Fairfield,Ala. T2 .....80.00
Fontana,Calif. K1 ....90.50
Gary,Ind. U5 .....80.00
Johnstown,Pa. B2 ....80.00
Lackawanna,N.Y. B2 ..80.00
Munhall,Pa. U5 .....80.00
Owensboro,Ky. G8 ....80.00
S.Chicago,Ill. R2, U5 ..80.00
S.Duquesne,Pa. U5 ....80.00
Sterling,Ill. N15 .....80.00
Youngstown R2 .....80.00

Carbon, Forging (NT)

Bessemer,Pa. U5 ....$99.50
Buffalo R2 .....99.50
Canton,O. R2 .....102.00
Clairton,Pa. U5 .....99.50
Conshohocken,Pa. A3 .99.50
Ensley,Ala. T2 .....99.50
Fairfield,Ala. T2 .....99.50
Farrell,Pa. S3 .....99.50
Fontana,Calif. K1 ....109.00
Gary,Ind. U5 .....99.50
Geneva,Utah C11 .....99.50
Houston S5 .....104.50
Johnstown,Pa. B2 ....99.50
Lackawanna,N.Y. B2 ..99.50
LosAngeles B3 .....109.00
Midland,Pa. C18 .....99.50
Munhall,Pa. U5 .....99.50
Owensboro,Ky. C8 ....99.50
Seattle B3 .....109.00
Sharon,Pa. S3 .....99.50
S.Chicago R2, U5, W14 .99.50
S.Duquesne,Pa. U5 ....99.50
S.SanFrancisco B3 ....109.00
Warren,O. C17 .....99.50

Alloy, Forging (NT)

Bethlehem,Pa. B2 ...$119.00
Bridgeport,Conn. C32 ..119.00
Buffalo R2 .....119.00
Canton,O. R2, T7 ....119.00
Conshohocken,Pa. A3 .121.00
Detroit S41 .....119.00
Economy,Pa. B14 .....119.00
Farrell,Pa. S3 .....119.00
Fontana,Calif. K1 ....140.00
Gary,Ind. U5 .....119.00
Houston S5 .....124.00
Ind.Harbor,Ind. Y1 ...119.00
Johnstown,Pa. B2 ....119.00
Lackawanna,N.Y. B2 ..119.00
LosAngeles B3 .....139.00
Lowellville,O. S3 ....119.00
Massillon,O. R2 .....119.00
Midland,Pa. C18 .....119.00
Munhall,Pa. U5 .....119.00
Owensboro,Ky. G8 ....119.00
Seattle(6) B3 .....140.00
Sharon,Pa. S3 .....119.00
S.Chicago R2,U5,W14 .119.00
S.Duquesne,Pa. U5 ..119.00
Struthers,O. Y1 .....119.00
Warren,O. C17 .....119.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2 .....$122.50
Canton,O. R2 .....125.00
Cleveland R2 .....122.50
Gary,Ind. U5 .....122.50
S.Chicago,Ill. R2,W14 .122.50
S.Duquesne,Pa. U5 ...122.50
Warren,O. C17 .....122.50

SKELP

Aliquippa,Pa. J5 .....5.05
Benwood,W.Va. W10 ...5.05
Ind.Harbor,Ind. Y1 ....5.05
Munhall,Pa. U5 .....5.05
Pittsburgh J5 .....5.05
Warren,O. R2 .....5.05
Youngstown R2, U5 ....5.05

WIRE RODS

AlabamaCity,Ala. R2 ...6.40
Aliquippa,Pa. J5 .....6.40
Alton,Ill. L1 .....6.60
Bartonville,Ill. K4 .....6.50
Buffalo W12 .....6.40
Cleveland A7 .....6.40
Donora,Pa. A7 .....6.40
Fairfield,Ala. T2 .....6.40
Houston S5 .....6.65
IndianaHarbor,Ind. Y1 .6.40
Johnstown,Pa. B2 .....6.40
Joliet,Ill. A7 .....6.40
KansasCity,Mo. S5 ....6.65
Kokomo,Ind. C16 .....6.50
LosAngeles B3 .....7.20
Minnequa,Colo. C10 ....6.65
Monessen,Pa. P7 .....6.40
Pittsburg,Calif. C11 ....7.20
Portsmouth,O. P12 ....6.40
Roebling,N.J. R5 .....6.50
S.Chicago,Ill. R2, W14..6.40
SparrowsPoint,Md. B2 ..6.50
Sterling,Ill.(1) N15 ....6.40
Sterling,Ill. N15 .....6.50
Struthers,O. Y1 .....6.40
Worcester,Mass. A7 ....6.70

STRUCTURALS

Carbon Steel Std. Shapes

AlabamaCity,Ala. R2 ...5.50
Aliquippa,Pa. J5 .....5.50
Atlanta A11 .....5.70
Bessemer,Ala. T2 .....5.50
Bethlehem,Pa. B2 .....5.55
Birmingham C15 .....5.50
Clairton,Pa. U5 .....5.50
Fairfield,Ala. T2 .....5.50
Fontana,Calif. K1 .....6.30
Gary,Ind. U5 .....5.50
Geneva,Utah C11 .....5.50
Houston S5 .....5.60
Ind.Harbor,Ind. I-2, Y1 .5.50
Johnstown,Pa. B2 .....5.55
Joliet,Ill. P22 .....5.50
KansasCity,Mo. S5 ....5.60
Lackawanna,N.Y. B2 ..5.55
LosAngeles B3 .....6.20
Minnequa,Colo. C10 ....5.80
Munhall,Pa. U5 .....5.50
Niles,Calif. P1 .....6.25
Phoenixville,Pa. P4 ....5.55
Portland,Oreg. O4 ....6.25
Seattle B3 .....6.25
S.Chicago,Ill. U5, W14 .5.50
S.SanFrancisco B3 ....6.15
Sterling,Ill. N15 .....5.50
Struthers,O. Y1 .....5.50
Torrance,Calif. C11 ....6.20
Weirton,W.Va. W6 .....5.50

Wide Flange

Bethlehem,Pa. B2 .....5.55
Clairton,Pa. U5 .....5.50
Fontana,Calif. K1 .....6.45
IndianaHarbor,Ind. I-2 .5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 .....5.50
Phoenixville,Pa. P4 ....5.55
S.Chicago,Ill. U5 .....5.50
Sterling,Ill. N15 .....5.50
Weirton,W.Va. W6 .....5.50

Alloy Std. Shapes

Aliquippa,Pa. J5 .....6.80
Clairton,Pa. U5 .....6.80
Gary,Ind. U5 .....6.80
Houston S5 .....6.90
Munhall,Pa. U5 .....6.80
S.Chicago,Ill. U5, W14..6.80

H.S., L.A., Std. Shapes

Aliquippa,Pa. J5 .....8.05
Bessemer,Ala. T2 .....8.05
Bethlehem,Pa. B2 .....8.10
Clairton,Pa. U5 .....8.05
Fairfield,Ala. T2 .....8.05
Fontana,Calif. K1 .....8.85
Gary,Ind. U5 .....8.05
Geneva,Utah C11 .....8.05
Houston S5 .....8.15
Ind.Harbor,Ind. I-2, Y1..8.05
Johnstown,Pa. B2 .....8.10
KansasCity,Mo. S5 ....8.15
Lackawanna,N.Y. B2 ...8.10
LosAngeles B3 .....8.75
Munhall,Pa. U5 .....8.05
Phoenixville,Pa. P4 ....8.10
Seattle B3 .....8.80
S.Chicago,Ill. U5, W14..8.05
S.SanFrancisco B3 ....8.70
Sterling,Ill. N15 .....7.75
Struthers,O. Y1 .....8.05

H.S., L.A., Wide Flange

Bethlehem,Pa. B2 .....8.10
Ind.Harbor,Ind. I-2 ....8.05
Lackawanna,N.Y. B2 ...8.10
Munhall,Pa. U5 .....8.05
S.Chicago,Ill. U5 .....8.05
Sterling,Ill. N15 .....7.75

PILING

BEARING PILES

Bethlehem,Pa. B2 .....5.55
Ind.Harbor,Ind. I-2 ....5.50
Lackawanna,N.Y. B2 ..5.55
Munhall,Pa. U5 .....5.50
S.Chicago,Ill. I-2, U5 ..5.50

STEEL SHEET PILING

Ind.Harbor,Ind. I-2 ....6.50
Lackawanna,N.Y. B2 ...6.50
Munhall,Pa. U5 .....6.50
S.Chicago,Ill. I-2, U5 ..6.50
Weirton,W.Va. W6 .....6.50

PLATES

PLATES, Carbon Steel

AlabamaCity,Ala. R2 ...5.30
Aliquippa,Pa. J5 .....5.30
Ashland,Ky.(15) A10 ...5.30
Atlanta A11 .....5.50
Bessemer,Ala. T2 .....5.30
Clairton,Pa. U5 .....5.30
Claymont,Del. P4 .....5.30
Cleveland J5, R2 .....5.30
Coatesville,Pa. L7 .....5.30
Conshohocken,Pa. A3 ...5.30
Ecorse,Mich. G5 .....5.30
Fairfield,Ala. T2 .....5.30
Farrell,Pa. S3 .....5.30
Fontana,Calif.(30) K1 ..6.10
Gary,Ind. U5 .....5.30
Geneva,Utah C11 .....5.30
GraniteCity,Ill. G4 ....5.40
Houston S5 .....5.40
Ind.Harbor,Ind. I-2, Y1.5.30
Johnstown,Pa. B2 .....5.30
Lackawanna,N.Y. B2 ..5.30
Mansfield,O. E6 .....5.30
Minnequa,Colo. C10 ....6.15
Munhall,Pa. U5 .....5.30
Newport,Ky. A2 .....5.30
Pittsburgh J5 .....5.30
Riverdale,Ill. A1 .....5.30
Seattle B3 .....6.20
Sharon,Pa. S3 .....5.30
S.Chicago,Ill. U5, W14..5.30
SparrowsPoint,Md. B2 ..5.30
Sterling,Ill. N15 .....5.30
Steubenville,O. W10 ....5.30
Warren,O. R2 .....5.30
Youngstown U5, Y1 ....5.30
Youngstown(27) R2 ....5.30

PLATES, Carbon Abras. Resist.

Claymont,Del. P4 .....7.05
Fontana,Calif. K1 .....7.85
Geneva,Utah C11 .....7.05
Houston S5 .....7.15
Johnstown,Pa. B2 .....7.05
SparrowsPoint,Md. B2 ..7.05

PLATES, Wrought Iron

Economy,Pa. B14 .....14.10

PLATES, H.S., L.A.

Aliquippa,Pa. J5 .....7.95
Ashland,Ky. A10 .....7.95
Bessemer,Ala. T2 .....7.95
Clairton,Pa. U5 .....7.95
Claymont,Del. P4 .....7.95
Cleveland J5, R2 .....7.95
Coatesville,Pa. L7 .....7.95
Conshohocken,Pa. A3 ...7.95
Economy,Pa. B14 .....7.95
Ecorse,Mich. G5 .....7.95
Fairfield,Ala. T2 .....7.95
Farrell,Pa. S3 .....7.95
Fontana,Calif.(30) K1 ..8.75
Gary,Ind. U5 .....7.95
Geneva,Utah C11 .....7.95
Houston S5 .....8.05
Ind.Harbor,Ind. I-2, Y1..7.95
Johnstown,Pa. B2 .....7.95
Munhall,Pa. U5 .....7.95
Pittsburgh J5 .....7.95
Seattle B3 .....8.85
Sharon,Pa. S3 .....7.95
S.Chicago,Ill. U5, W14..7.95
SparrowsPoint,Md. B2 ..7.95
Sterling,Ill. N15 .....7.625
Warren,O. R2 .....7.95
Youngstown U5, Y1 ....7.95

PLATES, Alloy

Aliquippa,Pa. J5 .....7.50
Claymont,Del. P4 .....7.50
Coatesville,Pa. L7 .....7.50
Economy,Pa. B14 .....7.50
Farrell,Pa. S3 .....7.50
Fontana,Calif. K1 .....8.30
Gary,Ind. U5 .....7.50
Houston S5 .....7.60
Ind.Harbor,Ind. Y1 ....7.50
Johnstown,Pa. B2 .....7.50
Lowellville,O. S3 .....7.50
Munhall,Pa. U5 .....7.50
Newport,Ky. A2 .....7.50
Pittsburgh J5 .....7.50
Seattle B3 .....8.40
Sharon,Pa. S3 .....7.50
S.Chicago,Ill. U5, W14..7.50
SparrowsPoint,Md. B2 ..7.50
Youngstown Y1 .....7.50

FLOOR PLATES

Cleveland J5 .....6.375
Claymont,Del. P4 .....6.375
Conshohocken,Pa. A3 ..6.375
Ind.Harbor,Ind. I-2 ....6.375
Munhall,Pa. U5 .....6.375
Pittsburgh J5 .....6.375
S.Chicago,Ill. U5 .....6.375

PLATES, Ingot Iron

Ashland c.l.(15) A10 ...5.55
Ashland l.c.l.(15) A10 ..6.05
Cleveland c.l. R2 .....6.05
Warren,O. R2 .....6.05

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)

Ala.City,Ala.(9) R2 ...5.675
Aliquippa,Pa.(9) J5 ...5.675
Alton,Ill. L1 .....5.875
Atlanta(9) A11 .....5.875
Bessemer,Ala.(9) T2 ...5.675
Birmingham(9) C15 ...5.675
Buffalo(9) R2 .....5.675
Canton,O. (23) R2 .....6.15
Clairton,Pa.(9) U5 ....5.675
Cleveland(9) R2 .....5.675
Ecorse,Mich.(9) G5 ....5.675
Emeryville,Calif. J7 ..6.425
Fairfield,Ala.(9) T2 ...5.675
Fairless,Pa.(9) U5 ....5.825
Fontana,Calif.(9) K1 ..6.375
Gary,Ind.(9) U5 .....5.675
Houston(9) S5 .....5.925
Ind.Harbor(9) I-2, Y1..5.675
Johnstown,Pa.(9) B2 ...5.675
Joliet,Ill. P2 .....5.675
KansasCity,Mo.(9) S5..5.925
Lackawanna(9) B2 .....5.675
LosAngeles(9) B3 .....6.375
Massillon,O.(23) R2 ....6.15
Midland,Pa.(23) C18 ...6.025
Milton,Pa. M18 .....5.825
Minnequa,Colo. C10 ....6.125
Niles,Calif. P1 .....6.375
Owensboro,Ky.(9) G8 ...6.025
Pittsburg,Calif.(9) C11..6.375
Pittsburgh(9) J5 .....5.675
Portland,Oreg. O4 .....6.425
Riverdale,Ill.(9) A1 ....5.675
Seattle(9) A24,B3,N15 ..6.425
S.Ch'e'go(9)R2,U5,W14 5.675
S.Duquesne,Pa.(9) U5..5.675
S.SanFran.,Calif.(9)B3 6.425
Sterling,Ill.(1)(9) N15..5.675
Sterling,Ill.(9) N15 ....5.775
Struthers,O.(9) Y1 .....5.675
Tonawanda,N.Y. B12 ...5.675
Torrance,Calif.(9) C11 .6.375
Warren,O. C17 .....6.025
Youngstown(9) R2,U5..5.675

BARS, Hot-Rolled Alloy

Aliquippa,Pa. J5 .....6.725
Bethlehem,Pa. B2 .....6.725
Bridgeport,Conn.C32 ....6.80
Buffalo R2 .....6.725
Canton,O. R2, T7 .....6.725
Clairton,Pa. U5 .....6.725
Detroit S41 .....6.725
Economy,Pa. B14 .....6.725
Ecorse,Mich. G5 .....6.725
Farrell,Pa. S3 .....6.725
Fontana,Calif. K1 .....7.775
Gary,Ind. U5 .....6.725
Houston S5 .....6.975
Ind.Harbor,Ind. I-2, Y1..6.725
Johnstown,Pa. B2 .....6.725
KansasCity,Mo. S5 ....6.975
Lackawanna,N.Y. B2 ...6.725
LosAngeles B3 .....7.775
Lowellville,O. S3 .....6.725
Massillon,O. R2 .....6.725
Midland,Pa. C18 .....6.725
Owensboro,Ky. G8 .....6.725
Pittsburgh J5 .....6.725
Seattle(6) B3 .....7.825
Sharon,Pa. S3 .....6.725
S.Chicago R2, U5, W14..6.725
S.Duquesne,Pa. U5 ....6.725
Struthers,O. Y1 .....6.725
Warren,O. C17 .....6.725
Youngstown U5 .....6.725

BARS & SMALL SHAPES, H.R. High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....8.30
Bessemer,Ala. T2 .....8.30
Bethlehem,Pa. B2 .....8.30
Clairton,Pa. U5 .....8.30
Cleveland R2 .....8.30
Ecorse,Mich. G5 .....8.30
Fairfield,Ala. T2 .....8.30
Fontana,Calif. K1 .....9.00
Gary,Ind. U5 .....8.30
Houston S5 .....8.55
Ind.Harbor,Ind. Y1 ....8.30
Johnstown,Pa. B2 .....8.30
KansasCity,Mo. S5 ....8.55
Lackawanna,N.Y. B2 ...8.30
LosAngeles B3 .....9.00
Pittsburgh J5 .....8.30
Seattle B3 .....9.05
S.Chicago,Ill. R2, W14..8.30
S.Duquesne,Pa. U5 ....8.30
S.SanFrancisco B3 ....9.05
Sterling,Ill. N15 .....7.925
Struthers,O. Y1 .....8.30
Youngstown U5 .....8.30

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa.(9) B2 ...5.825
Houston(9) S5 .....5.925
KansasCity,Mo.(9) S5..5.925
Lackawanna(9) B2 .....5.675
Sterling,Ill. N15 .....5.775
Sterling,Ill.(1) N15 ....5.675
Tonawanda,N.Y. B12 ...5.675

BAR SIZE ANGLES; S. SHAPES

Aliquippa,Pa. J5 .....5.675
Atlanta A11 .....5.875
Joliet,Ill. P22 .....5.675
Minnequa,Colo. C10 ....6.125
Niles,Calif. P1 .....6.375
Pittsburgh J5 .....5.675
Portland,Oreg. O4 .....6.425
SanFrancisco S7 .....6.52
Seattle B3 .....6.425

BAR SIZE ANGLES; S. SHAPES Wrought Iron

Economy,Pa. B14 .....16.45

BAR SHAPES, Hot-Rolled Alloy

Aliquippa,Pa. J5 .....6.80
Clairton,Pa. U5 .....6.80
Gary,Ind. U5 .....6.80
Houston S5 .....7.05
KansasCity,Mo. S5 ....7.05
Pittsburgh J5 .....6.80
Youngstown U5 .....6.80

BARS, C.F. Loaded (Including loaded extra)

Carbon

LosAngeles P2, S30 ...11.75*

Alloy

Ambridge,Pa. W18 ...10.175
BeaverFalls,Pa. M12 ..10.175
Camden,N.J. P13 .....10.35
Chicago W18 .....10.175
Elyria,O. W8 .....10.175
Monaca,Pa. S17 .....10.175
Newark,N.J. W18 .....10.35
SpringCity,Pa. K3 .....10.35

*Grade A; add 0.5c for Grade B.

BARS, Cold-Finished Carbon

Ambridge,Pa. W18 .....7.65
BeaverFalls,Pa. M12,R2..7.65
Birmingham C15 .....8.25
Buffalo B5 .....7.70
Camden,N.J. P13 .....8.10
Carnegie,Pa. C12 .....7.65
Chicago W18 .....7.65
Cleveland A7, C20 .....7.65
Detroit B5, H5, P17 .....7.85
Detroit S41 .....7.65
Donora,Pa. A7 .....7.65
Elyria,O. W8 .....7.65
FranklinPark,Ill. N5 ....7.65
Gary,Ind. R2 .....7.65
GreenBay,Wis. F7 .....7.65
Hammond,Ind. J5, L2 ..7.65
Hartford,Conn. R2 .....8.15
Harvey,Ill. B5 .....7.65
LosAngeles(49) S30 .....9.10
LosAngeles(49) P2, R2..9.10
Mansfield,Mass. B5 .....8.20
Massillon,O. R2, R8 .....7.65
Midland,Pa. C18 .....7.65
Monaca,Pa. S17 .....7.65
Newark,N.J. W18 .....8.10
NewCastle,Pa.(17) B4 ..7.65
Pittsburgh J5 .....7.85
Plymouth,Mich. P5 .....7.90
Putnam,Conn. W18 .....8.20
Readville,Mass. C14 .....8.20
Seattle(49) S30 .....9.10
S.Chicago,Ill. W14 .....7.65
SpringCity,Pa. K3 .....8.10
Struthers,O. Y1 .....7.65
Warren,O. C17 .....7.65
Waukegan,Ill. A7 .....7.65
Willimantic,Conn. J5 ..8.15
Youngstown F3, Y1 ....7.65

BARS, Cold-Finished Alloy (Turned and Ground)

Cumberland,Md.(5) C19..6.55

BARS, Cold-Finished Alloy

Ambridge,Pa. W18 .....9.025
BeaverFalls,Pa. M12,R2 9.025
Bethlehem,Pa. B2 .....9.025
Bridgeport,Conn. C32 ..9.175
Buffalo B5 .....9.025
Camden,N.J. P13 .....9.20
Canton,O. T7 .....9.025
Carnegie,Pa. C12 .....9.025
Chicago W18 .....9.025
Cleveland A7, C20 .....9.25
Detroit B5, P17 .....9.225
Detroit H5, S41 .....9.025
Donora,Pa. A7 .....9.025
Elyria,O. W8 .....9.025
FranklinPark,Ill. N5 ..9.025
Gary,Ind. R2 .....9.025
GreenBay,Wis. F7 .....9.025
Hammond,Ind. J5, L2..9.025
Hartford,Conn. R2 .....9.325
Harvey,Ill. B5 .....9.025
Lackawanna,N.Y. B3 ..9.025
LosAngeles P2, S30 ...11.00
Mansfield,Mass. B5 .....9.325
Massillon,O. R2, R8 .....9.025
Midland,Pa. C18 .....9.025
Monaca,Pa. S17 .....9.025
Newark,N.J. W18 .....9.20
Plymouth,Mich. P5 .....9.225

S.Chicago,Ill. W14 ....9.025
SpringCity,Pa. K3 ....9.20
Struthers,O. Y1 .....9.025
Warren,O. C17 .....9.025
Waukegan, Ill. A7 ....9.025
Willimantic,Conn. J5 ..9.325
Worcester,Mass. A7 ..9.325
Youngstown F3, Y1 ..9.025

BARS, Reinforcing, Billet (To Fabricators)

AlabamaCity,Ala. R2 ..5.675
Atlanta A11 .....5.00
Birmingham C15 .....5.25
Buffalo R2 .....5.675
Cleveland R2 .....5.675
Ecorse,Mich. G5 .....5.675
Emeryville,Calif. J7 ..6.425
Fairfield,Ala. T2 ....5.675
Fairless,Pa. U5 .....5.825
Fontana,Calif. K1 ....6.375
Ft.Worth,Tex.(26) T4 ..5.50
Gary,Ind. U5 .....5.675
Houston S5 .....5.675
Ind.Harbor,Ind. I-2, Y1.5.675
Johnstown,Pa. B2 ....5.675
Joliet,Ill. P22 .....5.675
KansasCity,Mo. S5 ....5.675
Kokomo,Ind. C16 ....5.775
Lackawanna,N.Y. B2..5.675
LosAngeles B3 .....6.375
Madison,Ill. L1 .....5.875
Milton,Pa. M18 .....5.825
Minnequa,Colo. C10 ...6.125
Niles,Calif. P1 .....6.375
Pittsburg,Calif. C11 ..'6.375
Pittsburgh J5 .....5.675
Portland,Oreg. O4 ....6.425
SandSprings,Okla. S5 ..5.675
Seattle A24, B3, N14 ..6.425
S.Chicago,Ill. R2, W14.5.675
S.Duquesne,Pa. U5 ....5.675
S.SanFrancisco B3 ....6.425
SparrowsPoint,Md. B2..5.675
Steelton,Pa. B2 .....5.675
Sterling,Ill. (1) N15 ..5.675
Sterling,Ill. N15 .....5.775
Struthers,O. Y1 .....5.675
Tonawanda,N.Y. B12 ...6.10
Torrance,Calif. C11 ...6.375
Youngstown R2, U5 ..5.675

BARS, Reinforcing, Billet (Fabricated: to Consumers)

Baltimore B2 .....7.42
Boston B2, U8 .....8.15
Chicago U8 .....7.41
Cleveland U8 .....7.39
Johnstown,Pa. B2 .....7.33
Lackawanna,N.Y. B2 ...7.35
Marion,O. P11 .....6.70
Newark,N.J. U8 .....7.80
Philadelphia U8 .....7.63
Pittsburgh J5, U8 .....7.35
SandSprings,Okla. S5 ...7.35

BARS, Rail Steel

ChicagoHts.(3) C2, I-2.5.575
ChicagoHts.(4) (44) I-2.5.675
ChicagoHts.(4) C2 ....5.675
Franklin,Pa.(3) F5 ....5.575
Franklin,Pa.(4)F5 ....5.675
JerseyShore,Pa.(3) J8 ..5.55
Marion,O.(3) P11 ....5.575
Tonawanda(3) B12 ....5.575
Tonawanda(4) B12 ....6.10

BARS, Wrought Iron

Economy,Pa. (S.R.)B14 15.10
Economy,Pa.(D.R.)B14 19.30
Econ.(DirectRolled) B14 13.55
Economy(Staybolt)B14 19.80
McK.Rks.(S.R.) L5 ...14.50
McK.Rks.(D.R.) L5 ...19.80
Mck.Rks.(Staybolt)L5 .20.95

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

AlabamaCity,Ala. R2 ..5.10
Allenport,Pa. P7 .....5.10
Aliquippa,Pa. J5 .....5.10
Ashland,Ky.(8) A10 ....5.10
Cleveland J5, R2 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit(8) M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Fairless,Pa. U5 .....5.15
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....5.10
Geneva,Utah C11 .....5.20
GraniteCity,Ill.(8) G4 ..5.20
Ind.Harbor,Ind. I-2, Y1.5.10
Irvin,Pa. U5 .....5.10
Lackawanna,N.Y. B2 ..5.10
Mansfield,O. E6 .....5.10
Munhall,Pa. U5 .....5.10
Newport,Ky. A2 .....5.10
Niles,O. M21, S3 .....5.10
Pittsburg,Calif. C11 ....5.80
Pittsburgh J5 .....5.10
Portsmouth,O. P12 ....5.10
Riverdale,Ill. A1 .....5.10
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. U5, W14..5.10
SparrowsPoint,Md. B2 ..5.10
Steubenville,O. W10 ....5.10
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5, Y1 ....5.10

SHEETS, H.R. (19 Ga. & Lighter)

Niles,O. M21, S3 ....6.275

SHEETS, H. R. Alloy

Gary,Ind. U5 .....8.40
Ind.Harbor,Ind. Y1 ....8.40
Irvin,Pa. U5 .....8.40
Munhall,Pa. U5 .....8.40
Newport,Ky. A2 .....8.40
Youngstown U5, Y1 ....8.40

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....7.525
Ashland,Ky. A10 .....7.525
Cleveland J5, R2 .....7.525
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.525
Fairless,Pa. U5 .....7.575
Farrell,Pa. S3 .....7.525
Fontana,Calif. K1 ....8.25
Gary,Ind. U5 .....7.525
Ind.Harbor,Ind. I-2, Y1 7.525
Irvin,Pa. U5 .....7.525
Lackawanna(35) B2 ...7.525
Munhall,Pa. U5 .....7.525
Niles,O. S3 .....7.525
Pittsburgh J5 .....7.525
S.Chicago,Ill. U5, W14..7.525
Sharon,Pa. S3 .....7.525
SparrowsPoint(36) B2..7.525
Warren,O. R2 .....7.525
Weirton,W.Va. W6 ....7.525
Youngstown U5, Y1 ...7.525

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ...5.35
Cleveland R2 .....5.875
Warren,O. R2 .....5.875

Sheets, Cold-Rolled Ingot Iron

Cleveland R2 .....7.05
Middletown,O. A10 ....6.775
Warren,O. R2 .....7.05

SHEETS, Cold-Rolled Steel (Commercial Quality)

AlabamaCity,Ala. R2 6.275
Aliquippa,Pa. J5 .....6.275
Allenport,Pa. P7 .....6.275
Cleveland J5, R2 ....6.275
Conshohocken,Pa. A3 ..6.325
Detroit M1 .....6.275
Ecorse,Mich. G5 .....6.275
Fairfield,Ala. T2 .....6.275
Fairless,Pa. U5 .....6.325
Follansbee,W.Va. F4 ..6.275
Fontana,Calif. K1 .....7.40
Gary,Ind. U5 .....6.275
GraniteCity,Ill. G4 ....6.375
Ind.Harbor,Ind. I-2, Y1 6.275
Irvin,Pa. U5 .....6.275
Lackawanna,N.Y. B2 ..6.275
Mansfield,O. E6 .....6.275
Middletown,O. A10 ....6.275
Newport,Ky. A2 .....6.275
Pittsburg,Calif. C11 ..7.225
Pittsburgh J5 .....6.275
Portsmouth,O. P12 ....6.275
SparrowsPoint,Md. B2..6.275
Steubenville,O. W10 ....6.275
Warren,O. R2 .....6.275
Weirton,W.Va. W6 ....6.275
Yorkville,O. W10 .....6.275
Youngstown Y1 .....6.275

SHEETS, Cold-Rolled, High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....9.275
Cleveland J5, R2 ....9.275
Ecorse,Mich. G5 .....9.275
Fairless,Pa. U5 .....9.325
Fontana,Calif. K1 ....10.40
Gary,Ind. U5 .....9.275
Ind.Harbor,Ind. I-2, Y1 9.275
Lackawanna(38) B2 ..9.275
Pittsburgh J5 .....9.275
SparrowsPoint(33) B2..9.275
Warren,O. R2 .....9.275
Weirton,W.Va. W6 ....9.275
Youngstown Y1 .....9.275

SHEETS, Culvert

	Cu Steel	Cu Fe
Ala.City,Ala. R2	7.125	....
Ashland,Ky. A10	7.225	7.475
Canton,O. R2	7.125	....
Fairfield,Ala. T2	7.125	7.375
Gary,Ind. U5	7.125	7.375
GraniteCity,Ill.G4	7.325	....
Ind.Harbor I-2	7.225	7.425
Irvin,Pa. U5	7.125	7.375
Kokomo,Ind. C16	7.325	....
MartinsFry. W10	7.125	7.375
Pitts.,Calif. C11	7.875	....
Pittsburgh J5	7.125	....
SparrowsPt. B2	7.225	....
Weirton W6	7.125	....

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 ...7.475

SHEETS, ENAMELING

Ashland,Ky. A10 .....6.775
Cleveland R2 .....6.775
Fairfield,Ala. T2 .....6.775
Gary,Ind. U5 .....6.775
Ind.Harbor,Ind. I-2, Y1 6.775
Irvin,Pa. U5 .....6.775
Middletown,O. A10 ....6.775
Niles,O. M21, S3 ....6.775
SparrowsPoint,Md. B2..6.775
Youngstown Y1 .....6.775

BLUED STOCK, 29 Gage

Dover,O. E6 .....8.70
Ind.Harbor,Ind. I-2 ....8.70
Mansfield,O. E6 .....8.70
Warren,O. R2 .....8.70
Yorkville,O. W10 .....8.70

SHEETS, Long Terne, Steel

Follansbee,W.Va. W10 .7.225
Gary,Ind. U5 .....7.225
Mansfield,O. E6 .....7.225
Middletown,O. A10 ....7.225
Niles,O. M21, S3 .....7.225
Warren,O. R2 .....7.225

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....7.625

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1) 9.525
Butler,Pa. A10 (type 2) 9.625
Irvin,Pa. U5 (type 1) ..9.525

SHEETS, Well Casing

Fontana,Calif. K1 ....7.325
Geneva,Utah C11 .....6.80

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....10.125
Pittsburgh J5 .....10.125
SparrowsPt.(39) B2 10.025

SHEETS, Galvannealed Steel

Canton,O. R2 .....7.175
Irvin,Pa. U5 .....7.175

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 .....7.125
Middletown,O. A10 ....7.125

SHEETS, Electrogalvanized

Canfield,O. C3 .....7.50
Cleveland (28) R2 .....7.65
Niles,O. (28) R2 .....7.65
Weirton,W.Va. W6 ....7.50

SHEETS, Galvanized Steel Hot-Dipped§

AlabamaCity,Ala. R2..6.875‡
Ashland,Ky. A10 ....6.875‡
Canton,O. R2 .....6.875‡
Dover,O. E6 .....6.875†
Fairfield,Ala. T2 ....6.875†
Gary,Ind. U5 .....6.875†
GraniteCity,Ill. G4 ...6.975*
Ind.Harbor,Ind. I-2 ..6.875†
Irvin,Pa. U5 .....6.875†
Kokomo,Ind. C16 ....6.975‡
MartinsFerry,O. W10..6.875*
Middletown,O. A10 ..6.875†
Pittsburg,Calif. C11 ..7.625*
Pittsburgh J5 .....6.875†
SparrowsPt.,Md. B2 ..6.875†
Warren,O. R2 .....6.875†
Weirton,W.Va. W6 ..6.875*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous. §For minimum spangled add 0.15c.

Key to Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.
A24 Alaska Steel Mills Inc.
A25 Algoma Steel Corp. Ltd.

B1 Babcock & Wilcox
B2 Bethlehem Steel Co.
B3 Bethlehem Steel Co., Pacific Coast Div.
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C3 Canfield Steel Co.
C4 Carpenter Steel Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co., Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
C32 Carpenter Steel of N.Eng.

D2 Detroit Steel Corp.
D4 Disston Div., H. K. Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas&Fuel Assoc.
E2 Eastern Stainless Steel
E6 Empire-Reeves Steel
E10 Enamel Prod. & Plating

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
G8 Green River Steel Corp.

H1 Hanna Furnace Corp.
H5 Hercules Drawn Steel
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins Steel Tube Works
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L6 Lone Star Steel Co.
L7 Lukens Steel Co.
L8 Leschen Wire Rope Div., H. K. Porter Co. Inc.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M14 McInnes Steel Co.
M16 Md. Fine & Specialty Wire Co. Inc.
M17 Metal Forming Corp.
M18 Milton Steel Div. Merritt-Chapman&Scott
M21 Mallory-Sharon Metals Corp.
M22 Mill Strip Products Co.
M23 Mill Strip Products Co. of Pennsylvania

N1 National-Standard Co.
N2 National Supply, Armco Steel Corp.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N14 Northwest. Steel Rolling Mills Inc.
N15 Northwestern S.&W. Co.
N20 Neville Ferro Alloy Co.

O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke&Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Div., Detroit Steel Corp.
P13 Precision Drawn Steel
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., American Chain & Cable
P17 Plymouth Steel Corp.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
P24 Phil. Steel & Wire Corp.

R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div., Eaton Mfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Div., Copperweld Steel Co.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Div., Bliss & Laughlin Inc.
S40 Seneca Steel Service
S41 Stainless & Strip Div., J & L Steel Corp.
S42 Southern Elec. Steel Co.
S43 Seymour Mfg. Co.
S44 Screw & Bolt Corp. of America
S45 Somers Brass Co.
S46 Steel Co. of Canada

T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Products & Chemical Corp.
T4 Texas Steel Co.
T5 Thomas Strip Div., Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U3 Union Wire Rope, Armco Steel Corp.
U4 Universal-Cyclops Steel
U5 U. S. Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div., U. S. Steel Corp.
U11 Union Carbide Metals Co.
U13 Union Steel Corp.

V2 Vanadium-Alloy Steel
V3 Vulcan-Kidd Steel Div., H. K. Porter Co.

W1 Wallace Barnes Steel Div., Associated Spring
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.

Y1 Youngstown Sheet & Tube

STRIP

STRIP, Hot-Rolled Carton

Ala.City,Ala.(27) R2 ...5.10
Allenport,Pa. P7 .....5.10
Alton,Ill. L1 .....5.30
Ashland,Ky.(8) A10 ....5.10
Atlanta A11 .....5.10
Bessemer,Ala. T2 .....5.10
Birmingham C15 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 .....5.825
Gary,Ind. U5 .....5.10
Ind.Harbor,Ind. I-2, Y1..5.10
Johnstown,Pa.(25) B2 ..5.10
Lackaw'na,N.Y.(25) B2.5.10
LosAngeles(25) B3 .....5.85
LosAngeles C1 .....8.60
Minnequa,Colo. C10 ....6.20
Riverdale,Ill. A1 .....5.10
SanFrancisco S7 .....6.60
Seattle(25) B3 .....6.10
Seattle N14 .....6.60
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. W14 .....5.10
S.SanFrancisco(25) B3 ..5.85
SparrowsPoint,Md. B2 ..5.10
Torrance,Calif. C11 ....5.85
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5, Y1 ....5.10

STRIP, Hot-Rolled Alloy

Carnegie,Pa. S18 .....8.40
Farrell,Pa. S3 .....8.40
Gary,Ind. U5 .....8.40
Houston S5 .....8.65
Ind.Harbor,Ind. Y1 .....8.40
KansasCity,Mo. S5 .....8.65
LosAngeles B3 .....9.60
Lowellville,O. S3 .....8.40
Newport,Ky. A2 .....8.40
Sharon,Pa. A2, S3 .....8.40
S.Chicago,Ill. W14 .....8.40
Youngstown U5, Y1 ....8.40

STRIP, Hot-Rolled High-Strength, Low-Alloy

Ashland,Ky. A10 .....7.575
Bessemer,Ala. T2 .....7.575
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.575
Fairfield,Ala. T2 .....7.575
Farrell,Pa. S3 .....7.575
Gary,Ind. U5 .....7.575
Ind.Harbor,Ind. I-2, Y1 7.575
Lackawanna,N.Y. B2 ..7.575
LosAngeles(25) B3 ....8.325
Seattle(25) B3 .....8.575
Sharon,Pa. S3 .....7.575
S.Chicago,Ill. W14 ....7.575
S.SanFrancisco(25) B3.8.325
SparrowsPoint,Md. B2 .7.575
Warren,O. R2 .....7.575
Weirton,W.Va. W6 ....7.575
Youngstown U5, Y1 ...7.575

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10 ....5.35
Warren,O. R2 .....5.875

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6 .....7.425
Baltimore T6 .....7.425
Boston T6 .....7.975
Buffalo S40 .....7.425
Cleveland A7 .....7.425
Dearborn,Mich. S3 ....7.425
Detroit D2, M1, P20 ..7.425
Dover,O. G6 .....7.425
Evanston,Ill. M22 .....7.425
Farrell,Pa. S3 .....7.425
Follansbee,W.Va. W10 .7.425
Fontana,Calif. K1 .....9.20
FranklinPark,Ill. T6 ..7.425
Ind.Harbor,Ind. Y1 ....7.425
Indianapolis S41 .....7.575
LosAngeles C1, S41 ....9.30
McKeesport,Pa. E10 ...7.525
NewBedford,Mass. R10.7.875
NewBritain,Conn. S15 .7.875
NewCastle,Pa. B4, M23.7.425
NewHaven,Conn. D2 ...7.875
NewKensington,Pa. A6.7.425
Pawtucket,R.I. R3, N8.7.975
Philadelphia P24 .....7.875
Riverdale,Ill. A1 .....7.425
Rome,N.Y.(32) R6 ....7.425
Sharon,Pa. S3 .....7.425
Trenton,N.J.(31) R5 ...8.875
Warren,O. R2, T5 ....7.425
Worcester,Mass. A7 ....7.975
Youngstown Y1 .....7.425
Youngstown S41 .....7.425

STRIP, Cold-Rolled Alloy

Boston T6 .....15.90
Carnegie,Pa. S18 .....15.55
Cleveland A7 .....15.55
Dover,O. G6 .....15.55
Farrell,Pa. S3 .....15.55
FranklinPark,Ill. T6 ..15.55
Harrison,N.J. S18 .....15.55
Indianapolis S41 .....15.70
LosAngeles S41 .....17.75
Lowellville,O. S3 .....15.55
Pawtucket,R.I. S8 ....15.90
Riverdale,Ill. A1 .....15.55
Sharon,Pa. S3 .....15.55
Worcester,Mass. A7 ....15.85
Youngstown S41 .....15.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7 .....10.80
Dearborn,Mich. S3 ....10.80
Dover,O. G6 .....10.80
Farrell,Pa. S3 .....10.80
Ind.Harbor,Ind. Y1 ....10.80
Sharon,Pa. S3 .....10.80
Warren,O. R2 .....10.80
Weirton,W.Va. W6 ....10.80
Youngstown Y1 .....10.80

STRIP, Galvanized (Continuous)

Farrell,Pa. S3 .....7.50
Sharon,Pa. S3 .....7.50

STRIP, Cold-Finished	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Spring Steel (Annealed)					
Anderson,Ind. G6	9.10	....	....	....	....
Baltimore T6	9.50	10.70	12.90	15.90	18.85
Boston T6	9.50	10.70	12.90	15.90	18.85
Bristol,Conn. W1	....	10.70	12.90	16.10	19.30
Carnegie,Pa. S18	8.95	10.40	12.60	15.60	....
Cleveland A7	8.95	10.40	12.60	15.60	18.55
Dearborn,Mich. S3	9.05	10.50	12.70	....	....
Detroit D2	9.05	10.50	12.70	15.70	....
Dover,O. G6	8.95	10.40	12.60	15.60	18.55
Evanston,Ill. M22	9.05	10.40	12.60	15.60	....
Farrell,Pa. S3	8.95	10.40	12.60	15.60	18.55
Fostoria,O. S1	10.05	10.40	12.60	15.60	....
FranklinPark,Ill. T6	9.05	10.40	12.60	15.60	18.55
Harrison,N.J. C18	....	....	12.90	16.10	19.30
Indianapolis S41	9.10	10.55	12.60	15.60	18.55
LosAngeles C1	11.15	12.60	14.80	17.80	....
LosAngeles S41	11.15	12.60	14.80	....	....
NewBritain,Conn. S15	9.40	10.70	12.90	15.90	18.85
NewCastle,Pa. B4, M23	8.95	10.40	12.60	15.60	....
NewHaven,Conn. D2	9.40	10.70	12.90	15.90	....
NewKensington,Pa. A6	8.95	10.40	12.60	15.60	....
NewYork W3	....	10.70	12.90	16.10	19.30
Pawtucket,R.I. N8	9.50	10.70	12.90	15.90	18.85
Riverdale,Ill. A1	9.05	10.40	12.60	15.60	18.55
Rome,N.Y. R6	8.95	10.40	12.60	15.60	18.55
Sharon,Pa. S3	8.95	10.40	12.60	15.60	18.55
Trenton,N.J. R5	....	10.70	12.90	15.90	18.85
Warren,O. T5	8.95	10.40	12.60	15.60	18.55
Worcester,Mass. A7, T6	9.50	10.70	12.90	15.90	18.85
Youngstown S41	8.95	10.40	12.60	15.60	18.55

Spring Steel (Tempered)	Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	18.85	22.95	27.80
Buffalo W12	18.85	....	....
Fostoria,O. S1	19.05	22.15	....
FranklinPark,Ill. T6	19.20	23.30	28.15
Harrison,N.J. C18	18.85	22.95	27.80
NewYork W3	18.85	22.95	27.80
Palmer,Mass. W12	18.55	....	....
Trenton,N.J R5	18.85	22.95	27.80
Worcester,Mass. A7, T6	18.85	22.95	27.80
Youngstown S41	19.20	23.30	28.15

STRIP, C.R. Electrogalvanized

Cleveland A7 .....7.425*
Dover,O. G6 .....7.425*
Evanston,Ill. M22 .....7.525*
McKeesport,Pa. E10 ..7.50*
New Castle,Pa. M23 ..7.425*
Riverdale,Ill. A1 .....7.525*
Warren,O. B9, S3, T5 .7.425*
Worcester,Mass. A7 ....7.975
Youngstown S41 .....7.425*

Plus galvanizing extras.

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2 .....8.175

TIGHT COOPERAGE HOOP

Atlanta A11 .....5.825
Farrell,Pa. S3 .....5.525
Riverdale,Ill. A1 .....5.675
Sharon,Pa. S3 .....5.525
Youngstown U5 .....5.525

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$9.10	$9.35	$9.75
Fairfield,Ala. T2	9.10	9.35	9.75
Fairless,Pa. U5	9.10	9.35	9.75
Fontana,Calif. K1	9.75	10.00	10.40
Gary,Ind. U5	9.10	9.35	9.75
GraniteCity,Ill. G4	9.20	9.45	9.85
IndianaHarbor,Ind. I-2, Y1	9.10	9.35	9.75
Irvin,Pa. U5	9.10	9.35	9.75
Niles,O. R2	9.10	9.35	9.75
Pittsburg,Calif. C11	9.75	10.00	10.40
SparrowsPoint,Md. B2	9.10	9.35	9.75
Weirton,W.Va. W6	9.10	9.35	9.75
Yorkville,O. W10	9.10	9.35	9.75

ELECTROLYTIC TIN-COATED SHEET (Dollars per 100 lb)			
Aliquippa,Pa. J5 (21-27 Ga.)	7.90	8.10	....
IndianaHarbor,Ind. Y1 (20-27 Ga.)	7.90	....	....
Niles,O. R2 (20-27 Ga.)	7.90	8.10	8.30

ELECTROLYTIC THIN TIN PLATE (¼ lb coating in coils)

	Base Box			
	45 lb	50 lb	55 lb	60 lb
Fairfield,Ala. T2	$6.10	$6.25	$6.40	$6.55
Fairless,Pa. U5	6.10	6.25	6.40	6.55
Gary,Ind. U5	6.10	6.25	6.40	6.55
IndianaHarbor,Ind. I-2	6.10	6.25	6.40	6.55
Irvin,Pa. U5	6.10	6.25	6.40	6.55
SparrowsPoint,Md. B2	6.10	6.25	6.40	6.55
Weirton,W.Va. W6	6.10	6.25	6.40	6.55

TIN PLATE, Hot Dipped Common Coke	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$10.40	$10.65
Fairfield,Ala. T2	10.40	10.65
Fairless,Pa. U5	10.40	10.65
Fontana,Calif. K1	11.05	11.30
Gary,Ind. U5	10.40	10.65
Irvin,Pa. U5	10.40	10.65
Pitts.,Calif. C11	11.05	11.30
Sp.Pt.,Md. B2	10.40	10.65
Weirton,W.Va. W6	10.40	10.65
Yorkville,O. W10	10.40	10.65

BLACK PLATE (Base Box)	
Aliquippa,Pa. J5	$8.20
Fairfield,Ala. T2	8.20
Fairless,Pa. U5	8.20
Fontana,Calif. K1	8.85
Gary,Ind. U5	8.20
GraniteCity,Ill. G4	8.30
Ind.Harbor,Ind. I-2, Y1	8.20
Irvin,Pa. U5	8.20
Niles,O. R2	8.20
Pittsburg,Calif. C11	8.85
SparrowsPoint, Md. B2	8.20
Weirton,W.Va. W6	8.20
Yorkville,O. W10	8.20

HOLLOWARE ENAMELING (Black Plate) (29 Gage)	
Aliquippa,Pa. J5	7.85
Gary,Ind. U5	7.85
Granite City,Ill. G4	7.95
Ind.Harbor,Ind. Y1	7.85
Irvin,Pa. U5	7.85
Yorkville,O. W10	7.85

SILICON STEEL

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	....	11.70	12.40	13.35	14.65
Brackenridge,Pa. A4	....	....	12.40	13.55	14.65
GraniteCity,Ill. G4	9.375*	11.30*	12.00*	13.15*	....
IndianaHarbor,Ind. I-2	9.375*	11.20*	11.90*	13.05*	....
Mansfield,O. E6	9.375*	11.70	12.40	13.55	14.65
Newport,Ky. A2	9.375	11.70*	12.40*	13.55*	14.65*
Niles,O. M21	9.375*	11.70	12.40	13.55	....
Vandergrift,Pa. U5	9.375*	11.70	12.40	13.55	14.65
Warren,O. R2	9.375*	11.70	12.40	13.55	14.65
Zanesville,O. A10	....	11.70†	12.40	13.55	14.65

	Stator
Mansfield,O. E6	8.10
Vandergrift,Pa. U5	8.10
Warren,O. R2 (Locore)	8.10

SHEETS (22 Ga., coils & cut lengths)

Fully Processed (Semiprocessed ½c lower)	T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	15.70	16.30	16.80	17.85
Zanesville,O. A10	15.70	16.30	16.80	17.85
Vandergrift,Pa. U5	15.70	16.30	16.80	17.85

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	18.10	19.70	20.20	20.70	15.70††
Butler,Pa. A10	....	....	....	19.70	20.20	20.70 ....
Vandergrift,Pa. U5	17.10	18.10	19.70	20.20	20.70	15.70
Warren,O. R2	....	....	....	....	....	.... 15.70‡

* Semiprocessed. †Fully processed only. ‡Coil annealed; semiprocessed ½c lower. ††Coils only.

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2 ..8.00
Aliquippa,Pa. J5 .....8.00
Alton,Ill. L1 .....8.20
Atlanta A1 .....8.00
Bartonville,Ill. K4 .....8.10
Buffalo W12 .....8.00
Chicago W13 .....8.00
Cleveland A7, C20 .....8.00
Crawfordsville,Ind. M8..8.10
Donora,Pa. A7 .....8.00
Duluth A7 .....8.00
Fairfield,Ala. T2 .....8.00
Fostoria,O.(24) S1 .....8.10
Houston S5 .....8.25
Jacksonville,Fla. M8 ...8.35
Johnstown,Pa. B2 .....8.00
Joliet,Ill. A7 .....8.00
KansasCity,Mo. S5 ....8.25
Kokomo,Ind. C16 .....8.10
LosAngeles B3 .....8.95
Minnequa,Colo. C10 ....8.25
Monessen,Pa. P7, P16...8.00
Palmer,Mass. W12 .....8.30
Pittsburg,Calif. C11 ....8.95
Portsmouth,O. P12 ....8.00
S.Chicago,Ill. R2 .....8.00
S.SanFrancisco C10 ....8.95
SparrowsPoint,Md. B2 ..8.10
Sterling,Ill.(1) N15 ....8.00
Sterling,Ill. N15 .....8.10
Struthers,O. Y1 .....8.00
Waukegan,Ill. A7 .....8.00
Worcester,Mass. A7 ....8.30

WIRE, Cold Heading Carbon

Elyria,O. W8 .....8.00

WIRE, Gal'd., for ACSR

Bartonville,Ill. K4 ....12.65
Buffalo W12 .....13.40
Cleveland A7 .....12.65
Donora,Pa. A7 .....12.65
Duluth A7 .....12.65
Johnstown,Pa.(10) B2 ..12.65
KansasCity,Mo. U3 ....12.90
LosAngeles(2) B3 .....13.60
Minnequa,Colo. C10 ..12.775
Monessen,Pa. P7, P16..12.65
Muncie,Ind. I-7 .....13.60
NewHaven,Conn. A7 ..12.95
Palmer,Mass. W12 ....13.70
Pittsburg,Calif. C11 ....13.45
Portsmouth,O. P12 ....12.65
Roebling,N.J. R5 .....12.95
SparrowsPt.,Md.(10)B2 12.75
Struthers,O. Y1 .....13.40
Trenton,N.J. A7 .....12.95
Waukegan,Ill. A7 .....12.65
Worcester,Mass. A7 ....12.95

WIRE, Upholstery Spring

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Johnstown,Pa. B2 .....9.75
KansasCity,Mo. S5, U3.10.00
Kokomo,Ind. C16 .....9.85
LosAngeles B3 .....10.70
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16 ..9.75
NewHaven,Conn. A7 ..10.95
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ..10.075
Portsmouth,O. P12 ....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ....9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....10.05
Waukegan,Ill. A7 .....9.75
Worcester,Mass. A7 ....10.05

WIRE, MB Spring, High-Carbon

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Bartonville,Ill. K4 .....9.85
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Fostoria,O. S1 .....9.80
Johnstown,Pa. B2 .....9.75
KansasCity,Mo. S5, U3.10.00
LosAngeles B3 .....10.70
Milbury,Mass.(12) N8 .10.05
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16 ..9.75
Muncie,Ind. I-7 .....9.95
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ....10.70
Portsmouth,O. P12 ....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ....9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....10.05
Waukegan,Ill. A7 .....9.75
Wor'ster,Mass.A7,J4,T6 10.05

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1 .....16.50
Bartonville,Ill. K4 ....16.40
Chicago W13 .....16.30
Cleveland A7 .....16.30
Crawfordsville,Ind. M8.16.40
Fostoria,O. S1 .....16.30
Houston S5 .....16.55
Jacksonville,Fla. M8 ..16.65
Johnstown,Pa. B2 ....16.30
KansasCity,Mo. S5 ....16.55
Kokomo,Ind. C16 .....16.30
Minnequa,Colo. C16 ....16.55
Monessen,Pa. P16 .....16.30
Muncie,Ind. I-7 .....16.50
Palmer,Mass. W12 ....16.60
S.SanFrancisco C10 ....17.15
Waukegan,Ill. A7 .....16.30
Worcester,Mass. A7, J6.16.60

ROPE WIRE (A)

Bartonville,Ill. K4 ....13.45
Buffalo W12 .....13.45
Fostoria,O. S41 .....13.45
Johnstown,Pa. B2 .....13.45
Monessen,Pa. P7 .....13.45
Muncie,Ind. I-7 .....13.65
Palmer,Mass. W12 ....13.75
Portsmouth,O. P12 ....13.45
Roebling,N.J. R5 .....13.75
St.Louis L8 .....13.45
SparrowsPt.,Md. B2 ...13.55
Struthers,O. Y1 .....13.45
Worcester,Mass. J4 ...13.75
(A) Plow and Mild Plow; add 0.25c for Improved Plow.

WIRE, Tire Bead

Bartonville,Ill. K4	17.15
Monessen,Pa. P16	17.15
Roebling,N.J. R5	17.65

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	12.35
Baltimore T6	12.65
Boston T6	12.65
Buffalo W12	12.35
Chicago W13	12.45
Cleveland A7	12.35
Crawfordsville,Ind. M8	12.35
Dover,O. G6	12.35
Evanston,Ill. M22	12.45
Farrell,Pa. S3	12.35
Fostoria,O. S1	12.35
FranklinPark,Ill. T6	12.45
Kokomo,Ind. C16	12.35
Massillon,O. R8	12.35
Milwaukee C23	12.55
Monessen,Pa. P7, P16	12.35
NewCastle,Pa. M23	12.35
Palmer,Mass. W12	12.65
Pawtucket,R.I. N8	12.65
Philadelphia P24	12.65
Riverdale,Ill. A1	12.45
Rome,N.Y. R6	12.35
Sharon,Pa. S3	12.35
Trenton,N.J. R5	12.65
Warren,O. B9	12.35
Worcester,Mass. A7, T6	12.65

NAILS, Stock Sizes

	Col.
AlabamaCity,Ala. R2	173
Aliquippa,Pa. J5	173
Atlanta A11	173
Bartonville,Ill. K4	175
Chicago W13	173
Cleveland A9	173
Crawfordsville,Ind. M8	175
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	178
Jacksonville,Fla. M8	175
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	178
Monessen,Pa. P7	173
Pittsburg,Calif. C11	192
Rankin,Pa. A7	173
S.Chicago,Ill. R2	173
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

(To Wholesalers: per cwt)

Galveston,Tex. D7	$10.30

NAILS, CUT (100 lb kegs)

Wheeling,W.Va. W10	$10.10

POLISHED STAPLES

	Col.
AlabamaCity,Ala. R2	175
Aliquippa,Pa. J5	173
Atlanta A11	173
Bartonville,Ill. K4	175
Crawfordsville,Ind. M8	177
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	180
Jacksonville,Fla. M8	177
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	180
Kokomo,Ind. C16	177
Minnequa,Colo. C10	178
Pittsburg,Calif. C11	194
Rankin,Pa. A7	173
S. Chicago,Ill. R2	175
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

TIRE WIRE, Automatic Baler (14½ Ga.) per 97 lb net box)
Coil No. 3150

AlabamaCity,Ala. R2	$8.78
Atlanta A11	10.36
Bartonville,Ill. K4	8.88
Buffalo W12	10.26
Chicago W13	9.24
Crawfordsville,Ind. M8	8.88
Donora,Pa. A7	8.78
Duluth A7	8.78
Fairfield,Ala T2	8.78
Houston S5	*9.02*
Jacksonville,Fla. M8	8.88
Johnstown,Pa. B2	8.78
Joliet,Ill. A7	8.78
KansasCity,Mo. S5	*9.02*
Kokomo,Ind. C16	8.88
LosAngeles B3	9.20
Minnequa,Colo. C10	9.02
Pittsburg,Calif. C11	9.44
S.Chicago,Ill. R2	8.78
S.SanFrancisco C10	9.94
SparrowsPt.,Md. B2	8.88
Sterling,Ill.(37) N15	8.88

Coil No. 6500 Stand.
100 lb coil

AlabamaCity,Ala. R2	$9.06
Atlanta A11	10.70
Bartonville,Ill. K4	9.16
Buffalo W12	10.60
Chicago W13	9.54
Crawfordsville,Ind. M8	9.16
Donora,Pa. A7	9.06
Duluth A7	9.06
Fairfield,Ala. T2	9.06
Houston S5	*9.30*
Jacksonville,Fla. M8	9.16
Johnstown,Pa. B2	9.06
Joliet,Ill. A7	9.06
KansasCity,Mo. S5	*9.30*
Kokomo,Ind. C16	9.06
Los Angeles B3	9.50
Minnequa,Colo. C10	9.30
Pittsburg,Calif. C11	9.75
S.Chicago,Ill. R2	9.06
S.SanFrancisco C10	10.26
SparrowsPt.Md. B2	9.16
Sterling,Ill.(37) N15	9.16

Coil No. 6500 Interim
100 lb coil

AlabamaCity,Ala. R2	$9.11
Atlanta A11	10.75
Bartonville,Ill. K4	9.21
Buffalo W12	10.65
Chicago W13	9.59
Crawfordsville,Ind. M8	9.21
Donora,Pa. A7	9.11
Duluth A7	9.11
Fairfield,Ala. T2	9.11
Houston S5	*9.35*
Jacksonville,Fla. M8	9.21
Johnstown,Pa. B2	9.11
Joliet,Ill. A7	9.11
KansasCity,Mo. S5	*9.35*
Kokomo,Ind. C16	9.21
LosAngeles B3	9.55
Minnequa,Colo. C10	9.35
Pittsburg,Calif. C11	9.80
S.Chicago,Ill. R2	9.11
S.SanFrancisco C10	10.31
SparrowsPt.,Md. B2	9.21
Sterling,Ill.(37) N15	9.21

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	212
Atlanta A11	212
Bartonville,Ill. K4	214
Crawfordsville,Ind. M8	214
Donora,Pa. A7	212
Duluth A7	212
Fairfield,Ala. T2	212
Houston S5	217
Jacksonville,Fla. M8	214
Joliet,Ill. A7	212
KansasCity,Mo. S5	217
Kokomo,Ind. C16	214
Minnequa,Colo. C10	217
SparrowsPt.,Md. B2	214
Sterling,Ill.(7) N15	214

FENCE POSTS

	Col.
Birmingham C15	177
ChicagoHts.,Ill. C2, I-2.	177
Duluth A7	177
Franklin,Pa. F5	177
Johnstown,Pa. B2	177
Marion,O. P11	177
Minnequa,Colo. C10	182
Tonawanda,N.Y. B12	177

WIRE, Barbed

	Col.
AlabamaCity,Ala R2	193**
Aliquippa,Pa. J5	190§
Atlanta A11	197*
Bartonville,Ill. K4	199
Crawfordsville,Ind. M8	198
Donora,Pa. A7	193†
Duluth A7	193†
Fairfield,Ala. T2	193†
Houston S5	198**
Jacksonville,Fla. M8	198
Johnstown,Pa. B2	196§
Joliet,Ill. A7	193†
KansasCity,Mo. S5	198**
Kokomo,Ind. C16	195†
Minnequa,Colo. C10	198**
Monessen,Pa. P7	196§
Pittsburg,Calif. C11	213†
Rankin,Pa. A7	193†
S.Chicago,Ill. R2	193**
SparrowsPoint,Md. B2	198§
Sterling,Ill.(7) N15	198

WIRE (16 gage)	An'ld Stone	Galv. Stone
Ala.City,Ala.R2	17.85	19.40**
Ali'ppa,Pa. J5	17.85	19.65
Bartonville K4	17.95	19.80
Chicago W13	17.85	
Cleveland A7	17.85	
Craw'sville M8	17.95	19.80‡‡
Fostoria,O. S1	18.35	19.90†
Houson S5	18.10	19.65**
Jacksonville M8	17.95	19.80‡‡
Johnstown B2	17.85	19.65§
Kan.City,Mo. S5	18.10	
Kokomo C16	17.95	19.50†
Minnequa C10	18.10	19.65**
P'lm'r,Mass.W12	18.15	19.70†
Pitts.Calif. C11	18.20	19.75†
S.SanFran. C10	18.20	19.75**
SparrowsPt. B2	17.95	19.75§
St'ling(37) N15	17.95	19.80
Waukegan A7	17.85	19.40†
Worcester A7	18.15	

WOVEN FENCE, 9-15 Ga.

	Col.
Ala.City,Ala. R2	187**
Aliq'ppa,Pa.9-11½ga.J5	190§
Atlanta A11	191*
Bartonville,Ill. K4	193
Crawfordsville,Ind. M8	192
Donora,Pa. A7	187†
Duluth A7	187†
Fairfield,Ala. T2	187†
Houston S5	192**
Jacksonville,Fla. M8	192
Johnstown,Pa.(42) B2	190§
Joliet,Ill. A7	187†
KansasCity,Mo. S5	192**
Kokomo,Ind. C16	189†
Minnequa,Colo. C10	192**
Pittsburg,Calif. C11	210†
Rankin,Pa. A1	187†
S.Chicago,Ill. R2	187**
Sterling,Ill.(7) N15	192

WIRE, Merchant Quality

	(6 to 8 gage) An'ld	Galv.
Ala.City,Ala. R2	9.00	9.55**
Aliquippa J5	8.65	9.325§
Atlanta(48) A11	9.00	9.75*
Bartonville(48) K4	9.85	19.90
Buffalo W12	9.00	9.55†
Chicago W13	9.00	9.55**
Cleveland A7	9.00	
Crawfordsville M8	9.10	9.80‡†
Donora,Pa. A7	9.00	9.55†
Duluth A7	9.00	9.55†
Fairfield T2	9.00	9.55
Houston(48) S5	9.25	9.80**
Jack'ville,Fla. M8	9.10	9.80‡‡
Johnstown(48) B2	9.00	9.675§
Joliet,Ill. A7	9.00	9.55†
KansasCity(48)S5	9.25	9.80**
Kokomo(48) S16	9.10	9.65†
LosAngeles B3	9.95	10.625§
Minnequa C10	9.25	9.80**
Monessen(48) P7	8.65	9.35§
Palmer,Mass. W12	9.30	9.85†
Pitts.,Calif. C11	9.95	10.50†
Rankin,Pa. A7	9.00	9.55†
SChicago R2	9.00	9.55**
S.SanFran. C10	9.95	10.50**
Spar'wsPt.(48)B2	9.10	9.775§
St'ling(37)(48)N15	9.10	9.80
Struthers,O. Y1	9.00	9.65‡
Worcester,Mass.A7	9.30	9.85†

Based on zinc prices of:: *13.50c. †5c. §10c. ‡Less than 10c. ††10.50c. ‡‡11.10c. **Subject to zinc equalization extras.

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great. Structural ½ in., larger 12.85 7/16 in. and smaller by 6 in. and shorter: 15% off list.

FASTENERS

(Consumer discounts per cent off list prices, orders for 1 container for assorted sizes; for less than container quantities, add 25 per cent; attaching nuts to bolts, package sizes, add 7.5 per cent: heavy hex nuts 1¼ in. through 1½ in. tapped 8 threads, add 10 per cent)

HEX HEADS CAP SCREWS, coarse, or fine thread, packaged or bulk, with or without hex nuts, 1020 steel bright and high carbon heat treated. ¼ in. thru 1 in. diam., listed lengths:

Hot Galvanized and Zinc Plated:	
Packaged	39.25
Bulk	46

BOLTS, Standard stock sizes:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	39.25
*Bulk	46

*Hot galvanized or zinc plated lag bolts only—for package or bulk quantities use applicable list less bulk discounts.

CAP AND SETSCREWS,

Fillister Head, Cap Screws, Coarse Thread:

Packaged	+55
Bulk	+16

Flat Head Cap Screws:

¾ in. and smaller, 6 in. and shorter:	
Packaged	+85
Bulk	+38

Setscrews, Square Head, Cup Point, Coarse Thread:

Through 1 in. diam., 6 in. and shorter:	
Packaged	+ 5
Bulk	19
Through 1 in. diam., longer than 6 in.:	
Packaged	+29

HEXAGON NUTS: American Standard: Finished hex, hex jam, and hex slotted coarse or fine fine thread, ¼ in. through 3 in., finished hex thick, thick and slotted, castle, fine thread, ¼ in. through 1½ in., semifinished hex heavy, heavy and jam, heavy and slotted, coarse thread, ¼ in. through 4 in., and

SQUARE NUTS, American Standard: Regular square and heavy square, coarse thread, ¼ in. through 2 in.:

Plain Finish	50
Hot Galvanized and Zinc Plated:	
Packaged	39.25
Bulk	46

PRESTRESSED STRAND

(High strength, stress relieved; 7 wire uncoated. Net prices per 1000 ft, 40,000 lb and over)

	Standard Diameter, Inches				
	1/4	5/16	3/8	7/16	1/2
Buffalo W12	$26.20	$38.50	$47.90	$61.30	$80.30
KansasCity,Mo. U3	26.20	38.50	47.90	61.30	80.30
Minnequa,Colo. C10	26.20	38.50	47.90	61.30	80.30
Pittsburg,Calif. C11	26.20	38.50	47.90	61.30	80.30
Roebling,N.J. R5	26.20	38.50	47.90	61.30	80.30
SparrowsPoint,Md. B2	26.20	38.50	47.90	61.30	80.30
St.Louis L8	26.20	38.50	47.90	61.30	80.30
Waukegan,Ill. A7	26.20	38.50	47.90	61.30	80.30

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut length 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	27.24	23.12
1¼	13	....	32.25	24.41
1½	13	30.42	35.65	26.98
1¾	13	35.94	42.12	31.89
2	13	40.28	47.21	35.74
2¼	13	45.36	58.17	40.26
2¼	12	49.24	57.72	43.70
2½	12	54.23	63.57	48.13
2¾	12	58.73	68.83	52.13
3	12	62.62	73.40	55.59

RAILWAY MATERIALS

Rails	Standard No. 1	Standard No. 2	All No. 2	Tee Rails 60 lb Under
Bessemer,Pa. U5	5.75	5.65	....	6.725
Ensley,Ala. T2	5.75	5.65	....	6.725
Fairfield,Ala. T2	....	....	....	6.725
Gary,Ind. U5	5.75	5.65	....	....
Huntington,W.Va. C15	....	....	....	6.725
Johnstown,Pa. B2	....	....	....(16)	6.725
Lackawanna,N.Y. B2	5.75	5.65	....	6.725
Minnequa,Colo. C10	5.75	5.65	....	7.225
Steelton,Pa. B2	5.75	5.65	....	....
Williamsport,Pa. S19	....	....	....	6.725

TIE PLATES

Fairfield,Ala. T2	6.875
Gary,Ind. U5	6.875
Lackawanna,N.Y. B2	6.875
Minnequa,Colo. C10	6.875
Seattle B3	7.025
Steelton,Pa. B2	6.875
Torrance,Calif. C11	7.025

JOINT BARS

Bessemer,Pa. U5	7.25
Fairfield,Ala. T2	7.25
Joliet,Ill. U5	7.25
Lackawanna,N.Y. B2	7.25
Minnequa,Colo. C10	7.25
Steelton,Pa. B2	7.25

AXLES

Ind.Harbor,Ind. S13	9.125
Johnstown,Pa. B2	9.125

SCREW SPIKES

Lebanon,Pa. B2	15.10

TRACK BOLTS, Untreated

Cleveland R2	15.35
KansasCity,Mo. S5	15.35
Lebanon,Pa. B2	15.35
Minnequa,Colo. C10	15.35
Pittsburgh S44	15.35
Seattle B3	15.85

STANDARD TRACK SPIKES

Fairfield,Ala. T2	10.10
Ind.Harbor,Ind. I-2, Y1	10.10
KansasCity,Mo. S5	10.10
Lebanon,Pa. B2	10.10
Minnequa,Colo. C10	10.10
Pittsburgh J5	10.10
Seattle B3	10.60
S.Chicago,Ill. R2	10.10
Struthers,O. Y1	10.10
Youngstown R2	10.10

FOOTNOTES

(1) Chicago base.
(2) Double galvanized.
(3) Merchant.
(4) Reinforcing.
(5) 1⅛ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in.; 6.70c; 1 15/16 to 8 in., inclusive, 7.05c.
(6) Limited analyses only.
(7) Chicago base 2 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Bethany A coating.
(12) Worcester, Mass., base.
(15) ¾" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill bands.
(26) Deld. in mill zone, 5.65c.
(27) Bar mill sizes.
(28) Bonderized.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝ in.; 7.375c, for widths ⅝ in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) 14 Ga., 48 in.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 13 Ga. & lighter; 60" & narrower.
(39) 48" and narrower.
(43) 9-14½ Ga.
(44) To fabricators.
(48) 6-7 Ga.
(49) 3½ in., and smaller rounds and 2½ in. and smaller hexagons; 9.65c for larger rounds and hexagons and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Ambridge, Pa. N2	+12.25	....	+5.75	....	+3.25	....	+1.75	....	+1.75	....	+2	....	0.5	....
Lorain, O. N3	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25
Youngstown Y1	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

ELECTRICWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+12.25	+28.75	+5.75	+23.5	+3.25	+21	+1.75	+19.5	+1.75	+19.5	+2	+19.75	0.5	+17.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Alton, Ill. L1	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Benwood, W. Va. W10	1.5	+27	+10.5	+36	+21	+45.5	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Butler, Pa. F6	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Fairless, Pa. N3	....	....	....	....	....	....	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Fontana, Calif. K1	....	....	....	....	....	....	+10.75	+28	+7.75	+24	+4.25	+19.5	+1.75	+18.25
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	1.25	+16	4.25	+12	7.75	+7.5	10.25	+6.25
Lorain, O. N3	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sharon, Pa. S4	4.5	+24	+8.5	+34	+19.5	+44	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Sparrows Pt., Md. B2	2.5	+26	+10.5	+36	+21.5	+46	0.25	+17	3.25	+13	6.75	+8.5	9.25	+7.25
Wheatland, Pa. W9	4.5	+24	+8.5	+34	+19.5	+44	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25
Youngstown R2, Y1	....	....	....	....	....	....	2.25	+15	5.25	+11	8.75	+6.5	11.25	+5.25

Size—Inches	1¼		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.75		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Alton, Ill. L1	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Benwood, W. Va. W10	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Etna, Pa. N2	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Fairless, Pa. N3	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Fontana, Calif. K1	+1.25	+17.25	+0.75	+16.75	0.75	+16.5	0.75	+16.5	+9.75	+27.5	+9.75	+27.5
Indiana Harbor, Ind. Y1	10.75	+5.25	11.25	+4.75	12.75	+4.5	12.75	+4.5	2.25	+15.5	2.25	+15.5
Lorain, O. N3	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	....	....	....	....
Sharon, Pa. M6	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Sparrows Pt., Md. B2	9.75	+6.25	10.25	+5.75	11.75	+5.5	11.75	+5.5	1.25	+16.5	1.25	+16.5
Wheatland, Pa. W9	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5
Youngstown R2, Y1	11.75	+4.25	12.25	+3.75	13.75	+3.5	13.75	+3.5	3.25	+14.5	3.25	+14.5

*Galvanized pipe discounts based on price of zinc at 11.50c, East St. Louis.

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling— Ingot	Slabs	Forging Billets	H.R. Strip	H.R. Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	22.75	25.00	....	36.00	....	43.50	39.25	48.50	45.00
202	24.75	28.25	37.75	39.00	42.25	44.50	40.00	49.25	49.25
301	24.00	26.00	38.75	37.25	43.50	46.00	41.25	51.25	47.50
302	26.25	29.50	39.50	40.50	44.25	46.75	42.25	52.00	52.00
302B	26.50	30.75	42.25	45.75	46.75	49.00	44.50	57.00	57.00
303	....	33.25	42.50	....	47.25	49.75	45.00	56.75	56.75
304	28.00	29.50	39.50	40.50	44.25	46.75	45.75	52.00	52.00
304L	....	37.25	47.25	48.25	52.00	54.50	53.50	59.75	59.75
305	29.50	34.75	44.00	47.50	47.00	49.50	46.25	58.75	58.75
308	32.00	36.25	49.00	50.25	54.75	57.75	55.25	63.00	63.00
309	41.25	47.50	60.00	64.50	66.25	69.50	66.00	80.50	80.50
310	51.50	59.50	81.00	84.25	89.75	94.50	87.75	96.75	96.75
314	....	....	80.50	....	89.75	94.50	87.75	....	104.25
316	41.25	47.50	64.50	68.50	71.75	75.75	71.75	80.75	80.75
316L	....	55.25	72.25	76.25	79.50	83.50	79.50	88.50	88.50
317	49.75	58.00	79.75	88.25	89.50	94.25	88.50	101.00	101.00
321	33.50	38.00	48.75	53.50	54.50	57.50	54.75	65.50	65.50
330	....	....	123.25	....	98.75	143.75	135.00	149.25	149.25
18-8 CbTa	38.50	48.25	57.75	63.50	63.75	67.25	64.75	79.25	79.25
403	....	....	26.75	....	29.75	31.50	30.00	40.25	40.25
405	20.25	26.50	30.75	36.00	34.75	36.50	32.50	46.75	46.75
410	17.50	19.50	26.75	31.00	29.75	31.50	30.00	40.25	40.25
416	....	....	29.75	....	33.75	35.50	31.25	48.25	48.25
420	....	31.50	35.50	41.75	40.75	42.75	40.25	62.00	62.00
430	17.75	19.75	29.75	32.00	33.75	35.50	31.00	40.75	40.75
430F	....	....	30.50	....	34.25	36.00	31.75	51.75	51.75
431	....	29.75	39.25	....	43.50	46.00	41.00	56.00	56.00
446	....	....	40.75	59.00	46.00	48.25	42.75	70.00	70.00

Producers Are: Allegheny Ludlum Steel Corp.; American Steel & Wire Div., U. S. Steel Corp.; Anchor Drawn Steel Co., division of Vanadium-Alloys Steel Co.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; A. M. Byers Co.; Calstrip Steel Corp.; G. O. Carlson Inc.; Carpenter Steel Co.; Carpenter Steel Co. of New England; Charter Wire Products; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Firth Sterling Inc.; Fort Wayne Metals Inc.; Green River Steel Corp., subsidiary of Jessop Steel Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Ellwood Ivins Steel Tube Works Inc.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Stainless & Strip Div., Jones & Laughlin Steel Corp.; Joslyn Stainless Steels, division of Joslyn Mfg. & Supply Co.; Latrobe Steel Co.; Lukens Steel Co.; Maryland Fine & Specialty Wire Co. Inc.; McLouth Steel Corp.; Metal Forming Corp.; Midvale-Heppenstall Co.; National Standard Co.; National Tube Div., U. S. Steel Corp.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Riverside-Alloy Metal Div., H. K. Porter Company Inc.; Rodney Metals Inc.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Somers Brass Co.; Specialty Wire Co. Inc.; Standard Tube Co.; Superior Steel Div., Copperweld Steel Co.; Superior Tube Co.; Swepco Tube Corp.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co., subsidiary of Crucible Steel Co. of America; Tube Methods Inc.; Ulbrich Stainless Steels, Inc.; Union Steel Corp.; U. S. Steel Corp.; Universal Cyclops Corp.; Vanadium-Alloys Steel Co.; Wall Tube & Metal Products Co.; Wallingford Steel, subsidiary of Allegheny Ludlum Steel Corp.; Washington Steel Corp.; Seymour Mfg. Co.

Clad Steel

	Plates 5%	Plates Carbon Base 10%	15%	20%	Sheets Carbon Base 20%
Stainless					
302	....	....	....	....	37.50
304	26.05	28.80	31.55	34.30	39.75
304L	30.50	33.75	36.95	40.15	....
316	38.20	42.20	46.25	50.25	58.25
316L	42.30	46.75	51.20	55.65	....
316 Cb	49.90	55.15	60.40	65.65	....
321	31.20	34.50	37.75	41.05	47.25
347	36.90	40.80	44.65	48.55	57.00
405	22.25	24.60	26.90	29.25	....
410	20.55	22.70	24.85	27.00	....
430	21.20	23.45	25.65	27.90	....
Inconel	49.80	61.35	72.80	84.40	....
Nickel	43.20	55.05	66.95	78.90	....
Nickel, Low Carbon	43.50	55.70	67.95	80.35	....
Monel	44.25	55.35	66.45	77.60	....

	Strip, Carbon Base —Cold Rolled— 10%	Both Sides
Copper*	36.10	43.00

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. P4; Coatesville, Pa. L7; New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Reg. Carbon (W-1)	0.330	Hi-Carbon-Cr (D-11)	0.955
Spec. Carbon (W-1)	0.385	V-Cr Hot Work (H-13)	0.550
Oil Hardening (O-1)	0.505	W-Cr Hot Work (H-12)	0.530
V-Cr Hot Work (H-11)	0.505	W Hot Wk (H-21)	1.425-1.44

Grade by Analysis (%) W	Cr	V	Co	Mo	AISI Designation	$ per lb
18	4	1	....	....	T-1	1.840
18	4	2	....	....	T-2	2.005
13.5	4	3	....	....	T-3	2.105
18.25	4.25	1	4.75	....	T-4	2.545
18	4	2	9	....	T-5	2.915
20.25	4.25	1.6	12.95	....	T-6	4.330
13.75	3.75	2	5	....	T-8	2.485
1.5	4	1	....	8.5	M-1	1.200
6.4	4.5	1.9	....	5	M-2	1.345
6	4	3	....	6	M-3	1.590

Tool steel producers include: A4, A8, B2, B8, C4, C9, C12, C18, F2, J3, L3, M14, S8, U4, V2, and V3.

Pig Iron

Prices in dollars per gross ton, f.o.b. (rail) furnace; add 50 cents when shipped by truck. Maximum delivered prices are approximate and based on rail shipment.

Birmingham District	Basic	No. 2 Foundry	Malle-able	Besse-mer
Birmingham R2	62.00	62.50**	66.50	....
Birmingham U6	....	62.50**	66.50	....
Woodward, Ala. W15	62.00*	62.50**	66.50	....
Cincinnati, deld.	....	70.20	....	....
Buffalo District				
Buffalo H1, R2	66.00	66.50	67.00	67.50
N. Tonawanda, N.Y. T9	....	66.50	67.00	67.50
Tonawanda, N.Y. W12	66.00	66.50	67.00	67.50
Boston, deld.	77.29	77.79	78.29	....
Rochester, N.Y., deld.	69.02	69.52	70.02	....
Syracuse, N.Y., deld.	70.12	70.62	71.12	....
Chicago District				
Chicago I-3	66.00	66.50	66.50	67.00
S. Chicago R2	66.00	66.50	66.50	67.00
S. Chicago, Ill. W14	66.00	....	66.50	67.00
Milwaukee, deld.	68.81	69.31	69.31	69.81
Muskegon, Mich., deld.	....	74.46	74.46	....
Cleveland District				
Cleveland R2, A7	66.00	66.50	66.50	67.00
Akron, Ohio, deld.	69.52	70.02	70.02	70.52
Mid-Atlantic District				
Birdsboro, Pa. B10	68.00	68.50	69.00	69.50
Chester, Pa. P4	Nom.	Nom.	Nom.	....
Swedeland, Pa. A3	68.00	68.50	69.00	69.50
NewYork, deld.	....	75.41	75.91	....
Newark, N.J., deld.	72.53	73.03	73.53	74.03
Philadelphia, deld.	70.18	70.68	71.18	71.68
Troy, N.Y. R2	68.00	68.50	69.00	69.50
Boston, deld.	75.20	75.70	76.20	76.70
Pittsburgh District				
NevilleIsland, Pa. P6	66.00	66.50	66.50	67.00
Pittsburgh (N&S sides), deld.	....	68.31	68.31	68.81
Monaca, Pa., deld.	....	68.33	68.33	68.83
Lawrenceville, W. Homestead, Wilmerding, Pa., deld.	....	68.68	68.68	69.18
Verona, Trafford, Pa., deld.	68.83	69.33	69.33	69.83
Brackenridge, Pa., deld.	69.16	69.66	69.66	70.16
Midland, Pa. C18	66.00	....	....	....
Youngstown District				
Hubbard, Ohio Y1	....	....	66.50	....
Sharpsville, Pa. S6	66.00	....	66.50	67.00
Youngstown Y1	....	....	66.50	....

Other U. S. Districts	Basic	No. 2 Foundry	Malle-able	Besse-mer
Duluth I-3	66.00	66.50	66.50	67.00
Erie, Pa. I-3	66.00	66.50	66.50	67.00
Fontana, Calif. K1	75.00	75.50	....	....
Geneva, Utah C11	66.00	66.50	....	....
GraniteCity, Ill. G4	67.90	68.40	68.90	....
Ironton, Utah C11	66.00	66.50	....	....
Minnequa, Colo. C10	68.00	68.50	69.00	....
Rockwood, Tenn. T3	62.00	62.50‡	66.50	67.00
Toledo, Ohio I-3	66.00	66.50	66.50	67.00
Cincinnati, deld.	72.94	73.44	....	....
Mansfield, Ohio, deld.	....	....	71.34	....
Canadian District				
Hamilton, Ont. S46	65.00	65.00	65.50	....
PortColborne, Ont. A25	65.00	65.00	65.50	66.00
SaultSte. Marie, Ont. A25	65.00	65.00	65.50	66.00

*Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.
**Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.50.
‡Phos. 0.50% up; Phos. 0.30-0.49%, $63.50.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.01-6.50% silicon; add 75c for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 13%; starting with silicon over 13% add $1 per ton for each 0.50% silicon or portion thereof up to 14%; over 14%, price is $93 with $1 differential; add $1 for each 0.50% Mn over 1%)

Buffalo H1	$79.25
Jackson, Ohio I-3, J1	78.00
PortColborne, Ont. A25	78.50
Toledo, Ohio I-3	78.00

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.50% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity, Ky. P15	$99.00
NiagaraFalls, N.Y. P15	99.00
Keokuk, Iowa Open-hearth & Fdry. K2	89.00
Keokuk, Iowa O.H. & Fdry, 12½ lb piglets, 16% Si, K2	92.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Birdsboro, Pa. B10 (Phos. 0.075% max)	$73.00
Lyles, Tenn. T3 (Phos. 0.035% max)	73.00
Rockwood, Tenn. T3 (Phos. 0.035% max)	73.00
Buffalo H1 (Intermediate) (0.036-0.075% max)	71.50
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Erie, Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
NevilleIsland, Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Swedeland, Pa. A3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Troy, N.Y. R2 (Phos. 0.075% max)	73.00

Steel Service Center Products

Representative prices, cents per pound, f.o.b. warehouse, for 2000 lb orders. Prices will vary with total weight of the order. City delivery charges are 15 cents per 100 lb except: Denver, 20 cents; Baltimore, Boston, New York, Philadelphia, San Francisco, 10 cents; Atlanta, Birmingham, Dallas, Houston, Los Angeles, Seattle, no charge.

	SHEETS			STRIP	BARS				PLATES	
	Hot Rolled	Cold Rolled	Galv.	Hot Rolled	H.R. Rounds	C.F. Rounds	H.R. Alloy 4140	STRUCTURAL SHAPES	Carbon	Floor
Atlanta	9.37	10.61	11.85	10.85	9.53	13.24	....	9.94	9.73	11.16
Baltimore	9.20	9.61	10.06	11.25	9.65	11.70	16.38	9.85	9.60	11.10
Birmingham	8.46	10.20	10.50	10.41	8.26	13.14	16.85	8.47	8.41	10.05
Boston	9.74	10.58	11.77	12.16	9.77	13.35	16.69	10.16	9.62	11.08
Buffalo	8.55	9.30	11.25	11.00	8.75	11.45	16.30	9.15	8.85	11.10
Charlotte, N. C.	10.52	11.22	10.55	11.51	10.32	12.68	....	10.53	10.47	12.11
Chicago	9.22	10.20	10.70	11.39	9.22	10.65	15.95	9.57	9.06	11.35
Cincinnati	9.34	10.26	10.75	11.71	9.33	11.53	16.27	10.14	9.44	11.68
Cleveland	9.22	10.66	10.92	11.51	9.33	11.25	16.06	9.96	9.30	11.59
Dallas	10.57	10.05	11.75	12.13	9.98	12.98	16.95	10.21	9.81	11.18
Detroit	9.48	10.46	11.05	11.76	9.53	11.01	16.23	10.14	9.43	11.61
Denver	9.41	11.77	12.11	9.86	10.10	11.47	....	10.02	9.69	11.83
Houston	10.17	9.65	11.35	11.73	9.58	13.10	16.55	9.81	9.41	10.78
Indianapolis	9.66	10.64	11.14	11.83	9.66	11.09	16.39	10.01	9.50	11.79
Kansas City	9.21	10.87	11.35	10.87	9.31	11.57	15.72	9.80	9.10	....
Los Angeles	10.35	11.20	12.10	12.40	10.25	14.20	17.35	10.45	10.30	12.30
Memphis, Tenn.	9.63	10.35	10.80	11.29	9.48	12.70	16.53	9.67	9.32	11.18
Milwaukee	9.36	10.34	10.84	11.53	9.36	10.89	16.09	9.79	9.20	11.49
Moline, Ill.	9.62	10.60	11.10	11.79	9.62	11.05	16.40	9.97	9.46	11.75
Newark, N. J.	9.36	10.13	11.35	11.46	9.74	13.25	16.40	10.20	9.51	11.05
New York	9.36	10.13	11.35	11.46	9.74	13.25	16.40	10.20	9.51	11.00
Philadelphia	9.50	10.00	10.89	11.25	9.65	11.95	16.48	9.85	8.85	11.10
Pittsburgh	9.22	10.53	11.58	11.49	9.22	11.25	16.95	8.91	9.06	11.35
Portland, Oreg.	10.40	12.25	12.35	12.40	10.40	16.65	17.85	11.00	10.55	12.70
St. Louis	9.42	10.58	11.08	11.59	9.44	11.28	16.33	9.80	9.28	11.59
St. Paul	9.57	10.24	11.39	11.74	9.57	11.49	16.54	9.92	9.41	11.70
San Francisco	10.17	11.69	11.40	11.78	10.07	15.10	18.20	10.49	10.38	12.47
Seattle	11.35	12.45	13.40	12.80	10.80	10.20	17.80	11.59	10.95	13.60
Spokane, Wash.	11.20	12.30	13.25	12.65	10.65	16.20	17.85	11.35	10.80	13.01

Specifications: Hot rolled sheet, sheared edge, 10 Ga. & 36 x 96-120 in.; cold rolled sheets, 20 Ga. & 36 x 96-120 in.; galvanized sheets, 10 Ga. x 36 x 120 in. except Los Angeles, Dallas and Houston, 10 Ga. x 48 x 120 in.; hot rolled strip, ⅛ in. x 1 in.; hot rolled carbon bars, rounds, ¾ in.—1¼ in., M1020; cold finished bars, 1 in., C1018; hot rolled alloy bars, 4140 annealed, 1⅝ in.—2⅝ in. rounds; structural shapes, I beams, 6 x 12½ in.; carbon plates, sheared, through ½ in. x 84 in.; floor plates, ¼ in. x 36 in.

Refractories

Fire Clay Brick (per 1000 pieces*)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Winburne, Snow Shoe, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo.; Ironton, Oak Hill, Parrall, Portsmouth, Ohio, Ottawa, Ill., Stevens Pottery, Ga., Canon City, Colo., $133; Templeton, Pa., $135; Salina, Pa., $138; Niles, Ohio, $139; Cutler, Utah, $175.

Super-Duty: Ironton, Ohio, Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Winburne, Snow Shoe, Pa., New Savage, Md., St. Louis, $200; Stevens Pottery, Ga., $210.

Silica Brick (per 1000 pieces*)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, Ohio, Hawstone, Pa., St. Louis, $158; Warren, Niles, Windham, Ohio; Hays, Latrobe, Morrisville, Pa., $163; E. Chicago, Ind., Joliet, Rockdale, Ill., $168; Canon City, Colo., $173; Lehi, Utah, $183; Los Angeles, $185.

Semisilica Brick (per 1000 pieces*)

Woodbridge, N. J., Canon City, Colo., $133; Philadelphia, Cclearfield, Pa., $138.

Ladle Brick (per 1000 pieces*)

Dry-Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Pa., Vandalia, Mo., New Salisbury, Ohio, $97; Vanport, Pa., Wellsville, Irondale, Ohio, $100; Clearfield, Pa., Portsmouth, Ohio, $102; St. Louis, Mexico, Mo., $120.

High-Alumina Brick (per 1000 pieces*)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., Danville, Ill., $250; Philadelphia, $265; Clearfield, Pa., $230; Orviston, Snow Shoe, Pa., $260.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $310; Danville, Ill., $313; Clearfield, Orviston, Snow Shoe, Pa., $320; Philadelphia, $325.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $350; Danville, Ill., $353; Clearfield, Orviston, Snow Shoe, Pa., $360; Philadelphia, $365.

Sleeves (per 1000)

St. Louis, $193; Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., $188; Ottawa, Ill., $205.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Pa., St. Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, St. Charles, Clearfield, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, Gibsonburg, Narlo, Ohio, $16.75; Thornton, McCook, Ill., $17; Dolly Siding, Bonne Terre, Mo., $15.00.

Magnesite (per net ton)

Domestic, dead-burned, ½ in. grains with fines; Chewelah, Wash., Luning, Nev., $46; ⅜ in. grains with fines: Baltimore (periclase), $73; Pascagoula, Miss. (periclase), $90.

*—9 in. x 4½ x 2.50 straights.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE

——Inches—— Diam	Length	Per 100 lb
2	24	$64.00
2½	30	41.50
3	40	39.25
4	40	37.00
5½	40	36.50
6	60	33.25
7	60	29.75
8, 9, 10	60	29.50
12	72	28.25
14	60	28.25
16	72	27.25
17	60	27.25
18	72	27.00
20	72	26.50
24	84	27.25

CARBON

8	60	14.25
10	60	13.80
12	60	14.75
14	60	14.75
14	72	12.55
17	60	12.65
17	72	12.10
20	90	11.55
24	72, 84	11.95
24	96	12.10
30	84	12.00
35, 40	110	11.60
40	100	12.50

Canadian Steel

(Cents per lb, f.o.b. mill, except as otherwise noted)

Billets, Blooms & Slabs:
Carbon (N.T.):
Forging $97.00
Rerolling 78.00
Alloy (N.T.) 115.00

Wire Rods:
Carbon 5.70
Alloy 6.40

Wire (carload lots):
Merchant annealed . 8.40
Low carbon indus. . 7.20
Upholstery spring .. 8.55
M.B. spring 8.85

Bars & Small Shapes:
Carbon, merchant .. 5.30
Carbon, special 5.85
Alloy 6.40

Bar Mill Bands:
Carbon 5.40
Alloy 8.05

Bars, Reinforcing 5.30

Structural Shapes:
Standard carbon ... 5.50
Angles & zees 5.40

Plates, Carbon:
Sheared 5.45
Universal mill 5.10

Fluorspar

Metallurgical grades, f.o.b. shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-$41; 70%, $36-$40; 60% $33-$36.50. Imported, net ton, f.o.b. cars point of entry, duty paid, metallurgical grade; European, $30-$33, contract; Mexican, all rail, duty paid, $28-$28.50; barge, Brownsville, Tex., $30-$31.

Metal Powder

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted.)

	Cents
Sponge Iron, domestic and foreign, 98% Fe, min. trucklots, freight allowed east of Mississippi River:	
100 mesh, bags	11.50
100 mesh, pails	9.85§
40 mesh, bags	8.10††
Electrolytic Iron,	
Melting stock, 99.9% Fe, irreg. fragments, ⅛ in. x 1.3 in.	28.75
(In contract lots of 750 tons price is 22.75c.)	
Annealed, 99.5% Fe ..	36.75, ton del. east of Mississippi.
Unannealed (99+% Fe)	33.0
Unannealed (99+% Fe) (minus 325 mesh) ..	58.0
Carbonyl Iron: 90-99.9%, 3 to 20 microns, depending on grade. 88.00-700.00 in standard 200-lb containers; all minus 200 mesh.	
Aluminum: Atomized, 600-lb drum freight allowed, c.l. 39.80; ton lots	41.80
Brass, 80/20, leaded (60 mesh)	36.50
Bronze powder, 90/10.	54.20
Copper, all types	15.00*
Lead	7.50*
Manganese, minus 35 mesh	1.00
Nickel, all types ...	0.78-1.06
Nickel-Silver	57.90
Solder	7.00*
Stainless Steel, 304 ...	89.00
Stainless Steel, 316 ...	$1.07
Steel, AISI 4650	32.00
Tin	14.00*
Zinc	23.20
Cobalt:	Dollars
98.5%, minus 100-300 mesh ..	1.57-1.58
99.5%, below 5 microns	2.32
Tungsten	nom.
Molybdenum	4.35

*Plus cost of metal. †Depending on mesh. §Cutting and scarfing grades. **Depending on price of ore. ††Welding grade.

Imported Steel

(Base per 100 lb, landed, duty paid; based on current ocean rates with any rise for buyer's acc't. Source of shipment: Western Europe)

	North Atlantic	Great Lakes	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305 ...	$5.80	$6.05	$5.75	$5.65	$5.95
Bar Size Angles	5.85	6.10	5.80	5.70	6.00
Structural Angles	5.75	6.00	5.70	5.60	5.90
I-Beams	5.70	5.95	5.65	5.55	5.85
Channels	5.70	5.95	5.65	5.55	5.85
Plates (basic bessemer)	5.45	5.80	5.50	5.40	5.70
Sheets, hot rolled and galvanized	Nom.	....	Nom.	Nom.	Nom.
Furring Channels, C.R., 1000 ft, ¾ x 0.30 lb per ft	25.20	24.70	24.40	24.40	25.20
Barbed Wire (†)	6.35	6.25	6.25	6.10	6.45
Merchant Bars	5.85	6.10	5.80	5.70	6.00
Hot-Rolled Bands	5.95	6.20	5.90	5.80	6.10
Wire Rods, Thomas Commercial No. 5	5.80	5.85	5.75	5.75	6.00
Wire Rods, O.H., No. 5	6.00	6.05	5.95	5.95	6.25
Bright Common Wire Nails (§)	6.80	7.05	6.75	6.65	6.95

†Per 82 lb net reel. §Per 100-lb keg, 20d nails and heavier.

Ores

Lake Superior Iron Ore

(Prices effective for the 1960 shipping season, subject to later revision, gross ton, 51.50% iron natural, rail of vessel, lower lake ports.)

Mesabi bessemer	$11.60
Lump ½ in. and up	12.85
Fines, under ½ in.	10.72
Mesabi nonbessemer	11.45
Old Range bessemer	11.85
Old Range nonbessemer	11.70
Open-hearth lump	12.70
High phos.	11.45

Based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 1, 1960; increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

New Jersey, concentrates ..... nom.

Foreign Iron Ore

Cents per unit

Swedish basic, 65%, c.i.f. Atlantic ports	25.00†
Chilean, 62-65%, c.i.f. Atlantic ports ...	22.00
Brazilian, (lump) 68.5%, f.o.b. vessel, Victoria, per ton	$11.50

Tungsten Ore

Net ton, unit

Foreign wolframite, good commercial quality	$15.50-16.00*
Domestic, concentrates, f.o.b. milling points	22.00-23.00

Manganese Ore

Mn 46-48%, Indian, 85-90c, nom. per long ton unit, c.i.f. U. S. ports, duty for buyer's account.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian	
48% 3:1	$34.00-35.00†
48% no ratio	25.00-26.00†
South Africa Transvaal	
44% no ratio	18.75
48% no ratio	24.00-26.00†
Turkish	
48% 3:1	35.00-37.00†
Domestic	
Rail nearest seller	
18% 3:1	30.00

Molybdenum

Sulfide concentrate, per lb of Mo content, mines, unpacked $1.23

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard

55-60%	$3.00-3.50
60-65%	3.60-4.00

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

*Before duty. †Nominal.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, Pa., furnace	$14.75-15.25
Connellsville, Pa., foundry	18.00-18.50

Oven Foundry

Birmingham, ovens	$30.35
Cincinnati, deld.	33.34
Buffalo, ovens	32.00
Chattanooga, Tenn., ovens	30.80
Detroit, ovens	32.00
Pontiac, Mich., deld.	34.05
Saginaw, Mich., deld.	35.63
Erie, Pa., ovens	32.00
Indianapolis, ovens	31.25
Ironton, Ohio, ovens	30.50
Cincinnati, deld.	33.64
Kearny, N. J., ovens	31.25
Milwaukee, ovens	32.00
Neville Island (Pittsburgh), Pa., ovens ..	30.75
New Haven, Conn., ovens	31.00
Painesville, Ohio, ovens	32.00
Cleveland, deld.	34.45
Philadelphia, ovens	31.00
St. Louis, ovens	33.00
St. Paul, ovens	31.25
Chicago, deld.	34.78
Swedeland, Pa., ovens	31.00
Terre Haute, Ind., ovens	31.25

Coal Chemicals

(Representative prices)

Cents per gal f.o.b. tank car or tank trucks, plant.	
Pure benzene	34.00
Xylene, industrial grade	29.00
Creosote	24.00
Naphthalene, 78 deg.	6.00
Toluene, one deg. (deld. east of Rockies)	25.00
Cents per lb, f.o.b. tank cars or tank trucks, deld.	
Phenol, 90 per cent grade	14.75
Per ton bulk, f.o.b. cars or trucks, plant.	
Ammonium sulfate, regular grade	$32.00

Structural Shapes . . .

Structural Shape Prices, Page 167

Seasonal expansion in building is reflected in growing order backlogs held by the fabricating shops. However, the betterment is largely in public work, such as schools, bridge, and road building. Fabricators are still pacing their orders for steel with new contracts.

Among large pending projects before the market is a $30 million General Motors Corp. plant in Fremont, Calif. It wil require 25,000 tons of steel. Another large job is a $21 million additon to Tidewater Oil Co.'s refinery near San Francisco. The Pacific Car & Foundry Co., Seattle, will fabricate 2500 tons of structurals for a 600 ft space needle at the Seattle Century 21 Expositon grounds.

Several other sizable jobs are before the market in the Pacific Northwest. They include 2500 tons for a highway project at Portland and 600 tons for a federal office building in Richland, Wash.

Except for a 3000 ton inquiry for a state Labor & Industry Building at Trenton, N. J., structural steel inquiry in the East involves few sizable jobs. There is a good sprinkling of small projects, and, in general, demand is holding up fairly well in the area.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

5520 tons, Kanawha River bridge, Contract No. 1, near Nitro, W. Va., Interstate Route 64, to Allied Structural Steel Co. and Midland Structural Steel Co., Chicago.

1300 tons, approaches to the second Lake Washington bridge, Seattle, to Poole, McGonigle & Dick, Portland, Oreg.

1200 tons, Oregon State traffic interchange, Medford, Oreg., to Vinnell Steel Co., Los Angeles; Peter Kiewit Sons Co., Vancouver, Wash., general contractor.

184 tons, wide flange, Military Industrial Supply Agency, Navy, Philadelphia, to Caine Steel Co., Philadelphia; also, 84 tons of stainless sheets, to Eastern Stainless Steel Corp., Baltimore.

169 tons, including 44 tons of reinforcing bars, state highway bridge, Newport, Maine, to Bancroft & Martin Rolling Mills Co., South Portland, Maine; Norman E. Jackson Inc., Pittsfield, Maine, general contractor.

166 tons, tee-sections, Military Industrial Supply Agency, Navy, Philadelphia, to Jones & Laughlin Steel Corp., Pittsburgh.

143 tons, two, three span composite wide flange beam bridges, Williston, Vt., highway contract 1-89-2 (9) contract 3, to Vermont Structural Steel Co., Burlington, Vt.; Lane Construction Co., Meriden, Conn., general contractor.

STRUCTURAL STEEL PENDING

1630 tons, Yellowtail Dam, Montana; general contract placed by the Bureau of Reclamation, Hardin, Mont.

3000 tons, State Labor & Industry Building, Trenton, N. J.; bids June 15.

600 tons, federal office building, Richland, Wash.; bids soon.

526 tons, six three-span composite, wide flange beam bridges, Interstate Route 89, Winooski, Vt.; bids May 19, Montpelier, Vt.; also, 262 tons of concrete reinforcing bars and 280 tons of steel piles.

300 tons plus, warehouse, General Electric Co., Seattle; bids in.

275 tons, department store and supermarket, Manuet, N. Y.; bids closed.

275 tons, Port of Tacoma grain gallery; general contract awarded to Baugh Construction Co., Seattle, low at $689,855.

Stocks of Ore on Mar. 31 Up from Year Ago

Stocks of iron ore on hand (in the U. S. and Canada) at the end of March were up sharply compared with those a year ago, 64,706,438 gross tons vs. 41,858,075, reports the American Iron Ore Association. Of the total, 36,519,958 tons were Lake Superior ore, which compared with only 17,172,021 tons held on Mar. 31, 1960.

Consumption of ore in March amounted to 7,532,817 gross tons, of which 4,228,843 tons were Lake Superior ore. In the same month last year, consumption was 12,419,427 tons, of which 6,547,941 tons were Lake Superior ore.

Consumption in the first three months this year totaled 20,773,997 tons, down noticeably from the 36,725,791 tons consumed in the same period of 1960.

At the end of March, there were 135 blast furnaces blowing, 124 in the U. S. and 11 in Canada. A year ago active furnaces totaled 237, of which 223 were in the U. S. and 14 in Canada.

Iron ore . . .

Iron Ore Prices, Page 173

Imports of iron ore in February, amounting to 1,861,622 net tons, brought the movement for the first two months of the year to 3,691,994 tons. That compares with 5,472,417 tons in the same period last year. Imports in 1960 came to 39,898,226 tons.

Ore exports in February totaled only 57,079 tons, bringing the total for the first two months of this year to 159,641 tons. That compares with 117,246 tons in the same period of 1960. Exports for all of 1960 amounted to 5,864,533 tons.

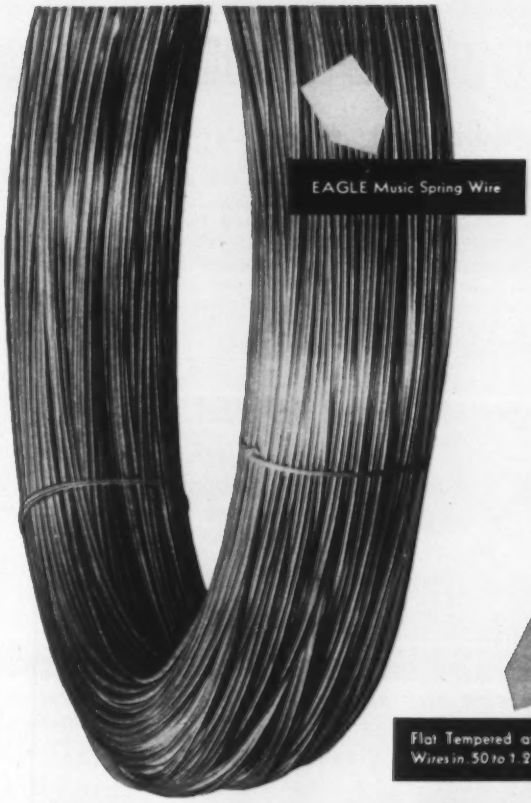
Iron Ore Statistics — March, 1961

Iron Ore Inventories—March, 1961
(Gross tons; all sources)

	U. S. Ores		Canadian Ores			
In Inventory	L. Sup.	Other	L. Sup.	Other	Foreign	Total
At Furnaces:						
Start of Month	33,305,468	3,302,252	1,608,483	4,294,401	17,376,838	59,887,442
End of Month						
Mass., New York	2,689,196	8,967	44,487	157,005	351,434	3,251,089
Pennsylvania	6,504,370	471,302	26,739	110,321	8,109,143	15,221,875
Md., Va., W. Va.	393,542	4,624	.....	1,464,196	3,043,925	4,906,287
Ky., Tenn., Tex.	242,921	156,554	.....	227,754	110,086	737,315
Alabama	871	1,761,762	.....	120,227	3,725,377	5,608,237
Ohio	8,102,034	21,538	718,178	1,592,745	1,264,074	11,698,569
Indiana	5,835,878	28,579	332,701	6,451	92,878	6,296,487
Illinois	3,713,428	58,697	43,434	.....	254,741	4,070,300
Mich., Minn.	2,447,542	.....	258,658	83,533	351,788	3,141,521
Colo., Utah, Calif.	.....	870,512	.....	.....	25,322	895,834
Undistributed	641	2,443	.....	.....	179	3,263
End of Month	29,930,423	3,384,978	1,424,197	3,762,232	17,328,947	55,830,777
At U. S. Docks	3,051,621	.....	215,327	893,058	2,448,741	6,608,747
Total U. S. Stocks	32,982,044	3,684,978	1,639,524	4,655,290	19,777,688	62,439,524
In Canada:						
Start of Month	2,120,493	.....	123,187	383,907	90,285	2,717,872
End of Month	1,782,285	.....	116,105	284,987	83,537	2,266,914
Total U. S. & Canada	34,764,329	3,384,978	1,755,629	4,940,277	19,861,225	64,706,438

Consumption of Iron Ore—March, 1961
(Gross tons; all sources)

	U. S. Ores		Canadian Ores			
In U. S.	L. Sup.	Other	L. Sup.	Other	Foreign	Total
Mass., New York	287,005	27,211	29,912	15,946	17,871	377,945
Pennsylvania	738,729	190,733	1,617	62,441	684,147	1,677,667
Md., Va., W. Va.	94,310	18,216	.....	264,434	299,903	676,863
Ky., Tenn., Tex.	22,789	74,796	.....	54,984	34,091	186,660
Alabama	.....	301,906	.....	3,473	144,337	449,716
Ohio	721,404	6,049	71,790	136,540	107,041	1,042,824
Indiana	946,208	893	70,148	.....	26,487	1,043,736
Illinois	429,079	9,489	2,043	.....	25,206	465,817
Mich., Minn.	390,615	.....	8,776	14,774	41,612	455,777
Colo., Utah, Calif.	.....	567,013	.....	.....	8,915	575,928
Undistributed	92	37	.....	.....	160	289
In U. S.						
Blast Furnaces	2,392,499	754,287	123,778	220,303	383,604	3,874,471
Steel Furnaces	94,348	42,159	2,171	15,530	317,821	472,029
Sintering	1,140,245	399,897	58,344	316,759	688,345	2,603,590
Miscellaneous	3,139	.....	7	.....	.....	3,132
Total U. S.	3,630,231	1,196,343	184,286	552,592	1,389,770	6,953,222
In Canada						
Blast Furnaces	247,340	.....	76,118	128,348	.....	451,806
Steel Furnaces	.....	.....	.....	18,880	6,748	25,628
Sintering	90,868	.....	.....	11,293	.....	102,161
Total Canada	338,208	.....	76,118	158,521	6,748	579,595
Total U. S. & Canada	3,968,439	1,196,343	260,404	711,113	1,396,518	7,532,817



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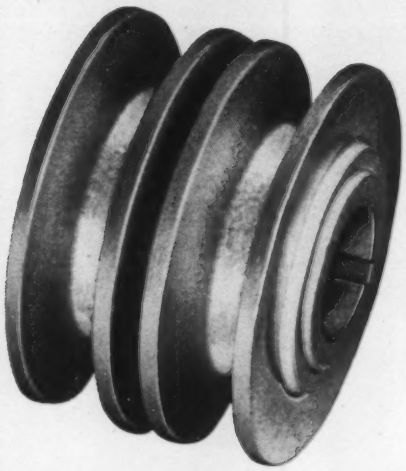

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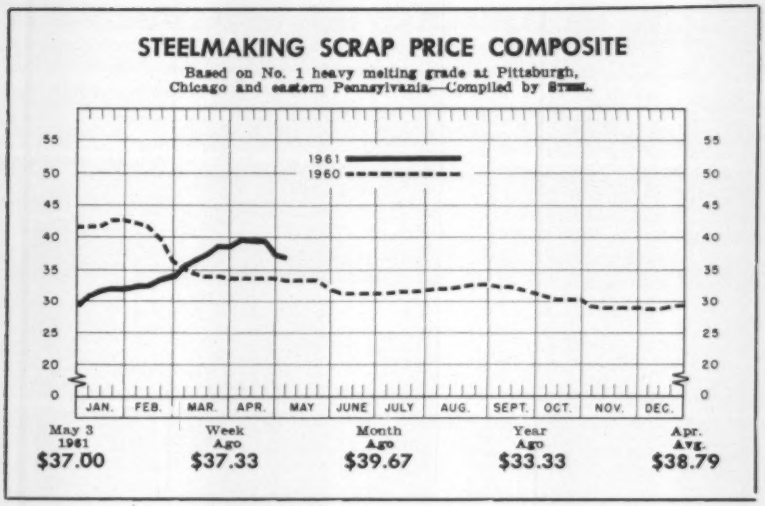

Scrap Price Downtrend Continues

STEEL's composite on No. 1 heavy melting drops another 33 cents a ton to $37 despite vigorous recovery in steelmaking operations. Export demand slackening

Scrap Prices, Page 178

● **Pittsburgh**—No. 1 heavy melting steel is off $1 a ton on a broker's purchase for a mill on the fringe of this district. Brokers' bids on factory bundles from an auto stamping plant averaged about $39 a ton, off $4 to $4.50 from bids on the April list. Bids on railroad scrap are lower across the board. Traders think the market trend will be sidewise through May.

● **Chicago** — Weakness prevails in the local scrap market, and recent developments tend to aggravate the situaton. Successful bids on 10,000 tons of No. 1 factory bundles to be produced by auto stamping plants in May were approximately $4 a ton below the winning bids a month ago—although they were $1 a ton off current quotations. A district mill announced $37 as its May price for No. 1 industrial heavy melting accepted as returns from customers. That's $1 under the prevailing price. Other influences: Greatly reduced export demand and increased use of hot metal in open hearth charges.

● **Philadelphia** — Prices continue soft. While there's no change in the major open hearth grades, there has been a drop on cast iron, electric furnace bundles, and some of the steel specialties. Domestic orders continue small, and while foreign shipments are active, there is little new buying on export account.

Electric furnace bundles are off $1 to $43, delivered, while low phos structurals and plates are down $1 to $43-$45, and couplers, springs and wheels are off $1 to $45, No. 1 cupola cast is quoted $2 lower at $40, and drop broken machinery is off $1 at $49-$50. Malleable is quoted at $49, on a purely nominal basis.

● **New York**—Brokers' buying prices on No. 1 cupola have dropped $2 a ton. Otherwise, prices are unchanged, with domestic demand listless. Exports of the major open hearth grades continue active against orders placed a few weeks ago.

● **Cleveland** — Rising steelmaking operations have not stimulated demand for dealer grades of scrap to any marked degree. In fact, as the steel rate has advanced, idle blast furnaces have been returned to operation, and steelmakers have turned to hot metal for their furnace charges instead of scrap. The downtrend in scrap prices is continuing. Last week, a Youngstown mill bought some No. 1 heavy melting industrial material at $38 a ton, which is off $2 from the price paid a few weeks ago.

● **Detroit**—The market is quiet following a drop in auto list prices that averaged $3 a ton. Dealers claim there are some small dealer-to-dealer transactions, but major broker buying on the auto lists came from out of the state. A Texas firm was a buyer of list bundles, reportedly covering export commitments.

● **Buffalo** — With steel operations rising, scrap dealers are anticipating larger orders shortly. Prices are steady; the local market does not reflect the weakness apparent at other market centers. Cast scrap was sold recently at quoted levels. There has been some slackening in export demand the last couple of weeks.

● **Cincinnati**—Prices on the principal steelmaking grades of scrap are off $1 a ton. No. 1 heavy melting

(*Please turn to Page* 183)

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Iron and Steel Scrap

Consumer prices per gross ton, except as otherwise noted, including brokers' commission, as reported to STEEL, May 3, 1961. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

May 3	$37.00
Apr. 26	37.33
Apr. Avg.	38.79
May 1960	33.07
May 1956	50.34

Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	*34.00-35.00*
No. 2 heavy melting	*28.00-29.00*
No. 1 dealer bundles	*34.00-35.00*
No. 2 bundles	25.00-26.00
No. 1 busheling	*34.00-35.00*
No. 1 factory bundles	*41.00-42.00*
Machine shop turnings	14.00-15.00
Mixed borings, turnings	14.00-15.00
Short turnings	18.00-19.00
Cast iron borings	17.00-18.00
Cut structurals:	
2 ft and under	39.00-40.00
3 ft and under	38.00-39.00
Heavy turnings	27.00-28.00
Punchings & plate scrap	41.00-42.00
Electric furnace bundles	43.00-44.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	37.00-38.00
Stove plate	37.00-38.00
Unstripped motor blocks	27.00-28.00
Clean auto cast	33.00-34.00
Drop broken machinery	45.00-46.00§

Railroad Scrap

No. 1 R.R. heavy melt.	*37.00-38.00*
Rails, 2 ft and under	*50.00-51.00*
Rails, 18 in. and under	51.00-52.00
Random rails	46.00-47.00
Angles, splice bars	45.00-46.00
Railroad specialties	*41.00-42.00*
Rails, rerolling	57.00-58.00

Stainless Steel Scrap

18-8 bundles & solids	180.00-185.00
18-8 turnings	105.00-110.00
430 bundles & solids	90.00-95.00
430 turnings	50.00-55.00

CHICAGO

No. 1 hvy melt., indus.	37.00-38.00
No. 1 hvy melt., dealer	35.00-36.00
No. 2 hvy melting	30.00-31.00
No. 1 factory bundles	*39.00-40.00*
No. 1 dealer bundles	*36.00-37.00*
No. 2 bundles	22.00-23.00
No. 1 busheling, indus.	37.00-38.00
No. 1 busheling, dealer	35.00-36.00
Machine shop turnings	15.00-16.00
Mixed borings, turnings	17.00-18.00
Shovel turnings	17.00-18.00
Cast iron borings	17.00-18.00
Cut structurals, 3 ft	*39.00-40.00*
Punchings & plate scrap	*40.00-41.00*

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Stove plate	*37.00-38.00*
Unstripped motor blocks	*34.00-35.00*
Clean auto cast	*47.00-48.00*
Drop broken machinery	*47.00-48.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*38.00-39.00*
R.R. malleable	*46.00-47.00*
Rails, 2 ft and under	*48.00-49.00*
Rails, 18 in. and under	*49.00-50.00*
Angles, splice bars	*41.00-42.00*
Axles	*57.00-58.00*
Rails, rerolling	*57.00-58.00*

Stainless Steel Scrap

18-8 bundles, solids	180.00-185.00
18-8 turnings	105.00-110.00
430 bundles & solids	*90.00-95.00*
430 turnings	50.00-55.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	27.00-28.00
No. 2 heavy melting	21.00-22.00
No. 1 bundles	30.00-31.00
No. 2 bundles	19.00-20.00
No. 1 busheling	27.00-28.00
Machine shop turnings	8.00-9.00
Mixed borings, turnings	9.00-10.00
Shovel turnings	10.00-11.00

Cast Iron Grades

No. 1 cupola	31.00-32.00
Stove plate	25.00-26.00
Heavy breakable	24.00-25.00
Unstripped motor blocks	22.00-23.00
Charging box cast	26.00-27.00
Clean auto cast	37.00-38.00

CLEVELAND

No. 1 heavy melting	33.00-34.00
No. 1 heavy melting	24.00-25.00†
No. 1 factory bundles	38.00-39.00
No. 1 bundles	33.00-34.00
No. 2 bundles	23.00-24.00†
No. 1 busheling	33.00-34.00
Machine shop turnings.	12.00-13.00
Shovel turnings	16.00-17.00
Mixed borings, turnings	16.00-17.00
Cast iron borings	16.00-17.00
Cut foundry steel	*30.00-33.00*
Cut structurals, plate, 2 ft and under	38.00-39.00
Low phos, punchings & plate	34.00-35.00
Alloy free, short shovel turnings	18.00-19.00
Electric furnace bundles	35.00-36.00

Cast Iron Grades

No. 1 cupola	39.00-40.00
Charging box cast	26.00-27.00
Heavy breakable cast	28.00-29.00
Stove plate	36.00-37.00
Unstripped motor blocks	31.00-32.00
Brake shoes	37.00-38.00
Clean auto cast	45.00-46.00
Burnt cast	32.00-33.00
Drop broken machinery	46.00-47.00

Railroad Scrap

R.R. malleable	47.00-48.00
Rails, 2 ft and under	47.00-48.00
Rails, random lengths	44.00-45.00
Rails, 18 in. and under	48.00-49.00
Cast steel	39.00-40.00
No. 1 railroad cast	48.00-49.00
Railroad specialties	*41.00-42.00*
Angles, splice bars	43.50-44.50
Rails, rerolling	53.00-54.00

Stainless Steel Scrap (Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	155.00-160.00
18-8 turnings	70.00-75.00
430 clips, bundles, solids	70.00-75.00
430 turnings	15.00-25.00

YOUNGSTOWN

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	25.00-26.00†
No. 1 busheling	36.00-37.00
No. 1 bundles	36.00-37.00
No. 2 bundles	25.00-26.00†
Machine shop turnings.	14.00-15.00†
Shovel turnings	19.00-20.00†
Cast iron borings	19.00-20.00†
Low phos.	37.00-38.00
Electric furnace bundles	38.00-39.00

Railroad Scrap

No. 1 R.R. heavy melt.	37.00-38.00

BUFFALO

No. 1 heavy melting	31.00-32.00
No. 2 heavy melting	26.00-27.00
No. 1 bundles	31.00-32.00
No. 2 bundles	24.00-25.00
No. 1 busheling	31.00-32.00
Shovel turnings	17.00-18.00
Machine shop turnings.	13.00-14.00
Cast iron borings	15.00-16.00
Low phos. structurals and plates, 2 ft and under	39.00-40.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	38.00-39.00
No. 1 machinery	45.00-46.00

Railroad Scrap

Rails, random lengths	42.00-43.00
Rails, 3 ft and under	48.00-49.00
Rails, rerolling	61.00-62.00
Railroad specialties	41.00-42.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*30.00-31.00*
No. 2 heavy melting	27.50-28.50
No. 1 bundles	*31.00-32.00*
No. 2 bundles	*19.00-20.00*
No. 1 busheling	*30.00-31.00*
Machine shop turnings.	10.00-11.00
Mixed borings, turnings	11.00-12.10
Shovel turnings	12.00-13.00
Cast iron borings	11.00-12.00
Low phos. 18 in.	38.00-39.00

Cast Iron Grades

No. 1 cupola	36.00-37.00
Heavy breakable cast	28.00-29.00
Charging box cast	34.00-35.00
Drop broken machinery	46.00-47.00

Railroad Scrap

No. 1 R.R. heavy melt.	33.00-34.00
Rails, 18 in. and under	46.00-47.00
Rails, random lengths	40.00-41.00

PHILADELPHIA

No. 1 heavy melting	40.00
No. 2 heavy melting	35.00
No. 1 bundles	42.00
No. 2 bundles	25.00
No. 1 busheling	41.00
Electric furnace bundles	*43.00*
Mixed borings, turnings	17.00†
Shovel turnings	20.00
Machine shop turnings.	15.00†
Heavy turnings	27.00†
Structurals & plates	*43.00-45.00*
Couplers, springs, wheels	*45.00*
Rail crops, 2 ft & under	52.00-54.00

Cast Iron Grades

No. 1 cupola	*40.00*
Heavy breakable cast	40.00
Drop broken machinery	*49.00-50.00†*
Malleable	*49.00†*

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	30.00-31.00
No. 2 heavy melting	23.00-24.00
No. 1 bundles	30.00-31.00
No. 2 bundles	20.00-21.00
Machine shop turnings.	5.50-6.00†
Mixed borings, turnings	6.00-6.50†
Shovel turnings	7.00-8.00†
Low phos. structural & plates	32.00-33.00

Cast Iron Grades

No. 1 cupola	*34.00-35.00*
Unstripped motor blocks	25.00-26.00
Heavy breakable	31.00-32.00

Stainless Steel

18-8 sheets, clips, solids	155.00-160.00
18-8 borings, turnings	70.00-75.00
410 sheets, clips, solids	40.00-45.00
430 sheets, clips, solids	55.00-60.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	28.50-29.00
No. 2 heavy melting	25.00-26.00
No. 1 bundles	28.00-29.00
No. 1 busheling	28.50-29.00
Machine shop turnings	5.00-6.00
Shovel turnings	9.00-9.50
No. 1 cast	39.00-40.00
Mixed cupola cast	32.00-33.00
No. 1 machinery cast	40.00-42.00

BIRMINGHAM

No. 1 heavy melting	33.00-34.00
No. 2 heavy melting	*27.00-28.00*
No. 1 bundles	32.00-33.00
No. 2 bundles	*19.00-20.00*
No. 1 busheling	32.00-33.00
Cast iron borings	10.00-11.00
Machine shop turnings	19.00-20.00
Shovel turnings	21.00-22.00
Bar crops and plates	42.00-43.00
Structurals & plate	42.00-43.00
Electric furnace bundles	37.00-38.00
Electric furnace:	
3 ft and under	36.00-37.00
2 ft and under	37.00-38.00

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Stove plate	43.00-44.00
Unstripped motor blocks	*31.00-32.00*
No. 1 wheels	35.00-36.00

Railroad Scrap

No. 1 R.R. heavy melt.	33.00-34.00
Rails, 18 in. and under	44.00-45.00
Rails, random lengths	*40.50-41.50*
Angles, splice bars	*42.00-43.00*

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	34.00
No. 2 heavy melting	28.00
No. 1 bundles	34.00
No. 2 bundles	*24.00*
No. 1 busheling	34.00
Machine shop turnings	13.00
Shovel turnings	16.00

Cast Iron Grades

No. 1 cupola	38.00
Charging box cast	34.00
Heavy breakable cast	32.00
Unstripped motor blocks	34.00
Clean auto cast	38.00
Stove plate	33.00

Railroad Scrap

No. 1 R.R. heavy melt.	*35.00*
Rails, random lengths	*37.00*
Rails, rerolling	52.00-53.00
Rails, 18 in. and under	*43.00*
Angles, splice bars	40.00†

HOUSTON

(Brokers' buying prices; f.o.b. car)

No. 1 heavy melting	38.00-39.00†
No. 2 heavy melting	36.00†
No. 1 bundles	37.00-38.00†
No. 2 bundles	25.00-26.00†
Machine shop turnings.	12.00-13.00†
Low phos. plate & structurals:	
3 ft	43.00†
2 ft and under	45.00-46.00†

Cast Iron Grades

No. 1 cupola	37.00-38.00†
Heavy breakable	26.00-27.00†
Foundry malleable	30.00-31.00†
Unstripped motor blocks	31.00-32.00†

Railroad Scrap

R.R. heavy melt. (3 ft)	43.00†

LOS ANGELES

No. 1 heavy melting	38.00-40.00
No. 1 hvy melt (export)	40.00-45.00
No. 2 heavy melting	34.00-37.00
No. 2 hvy melt (export)	40.00-43.00
No. 1 bundles	30.00-31.00
No. 2 bundles	25.00
No. 2 bundles (export)	27.00-28.00
Machine shop turnings.	15.00-17.00
Shovel turnings	15.00-17.00
Cast iron borings	16.00-17.00
Cut structurals and plate 1 ft and under	52.00

Cast Iron Grades

No. 1 cupola	50.00

Railroad Scrap

No. 1 R.R. heavy melt.	42.00

PORTLAND, OREG.

(Prepared, f.o.b. car)

No. 1 heavy melting	44.00-45.00
No. 2 heavy melting	41.00
No. 2 bundles	31.00
Shovel turnings	16.00-18.00
Electric furnace bundles	52.00

Cast Iron Grades

No. 1 cupola	40.00-42.00
Heavy breakable	36.00-37.00
Unstripped motor blocks	37.00
Stove plate (f.o.b. plant)	37.00

SEATTLE

(Prepared, f.o.b. car)

No. 1 heavy melting	44.00
No. 1 hvy (unprepared)	41.00
No. 2 heavy melting	41.00
No. 2 hvy (unprepared)	38.00
No. 2 bundles	31.00
Shovel turnings	16.00
Electric furnace bundles	50.00

Cast Iron Grades

No. 1 cupola	42.00
Heavy breakable cast	39.00
Unstripped motor blocks	39.00-40.00
Stove plate (f.o.b. plant)	37.00

SAN FRANCISCO

No. 1 heavy melting	42.00**
No. 2 heavy melting	39.00**
No. 1 bundles	34.00**
No. 2 bundles	27.00**
Machine shop turnings	20.00**
Mixed borings, turnings	20.00**
Cast iron borings	20.00**
Heavy turnings	20.00**
Shovel turnings	20.00**
Cut structurals, 3 ft	44.00

Cast Iron Grades

No. 1 cupola	46.00-47.00
Charging box cast	34.00
Stove plates	34.00
Heavy breakable cast	28.00
Unstripped motor blocks	31.00
Clean auto cast	40.00
Drop broken machinery	45.00-46.00
No. 1 wheels	34.00

HAMILTON, ONT.

(Brokers' buying prices; net tons)

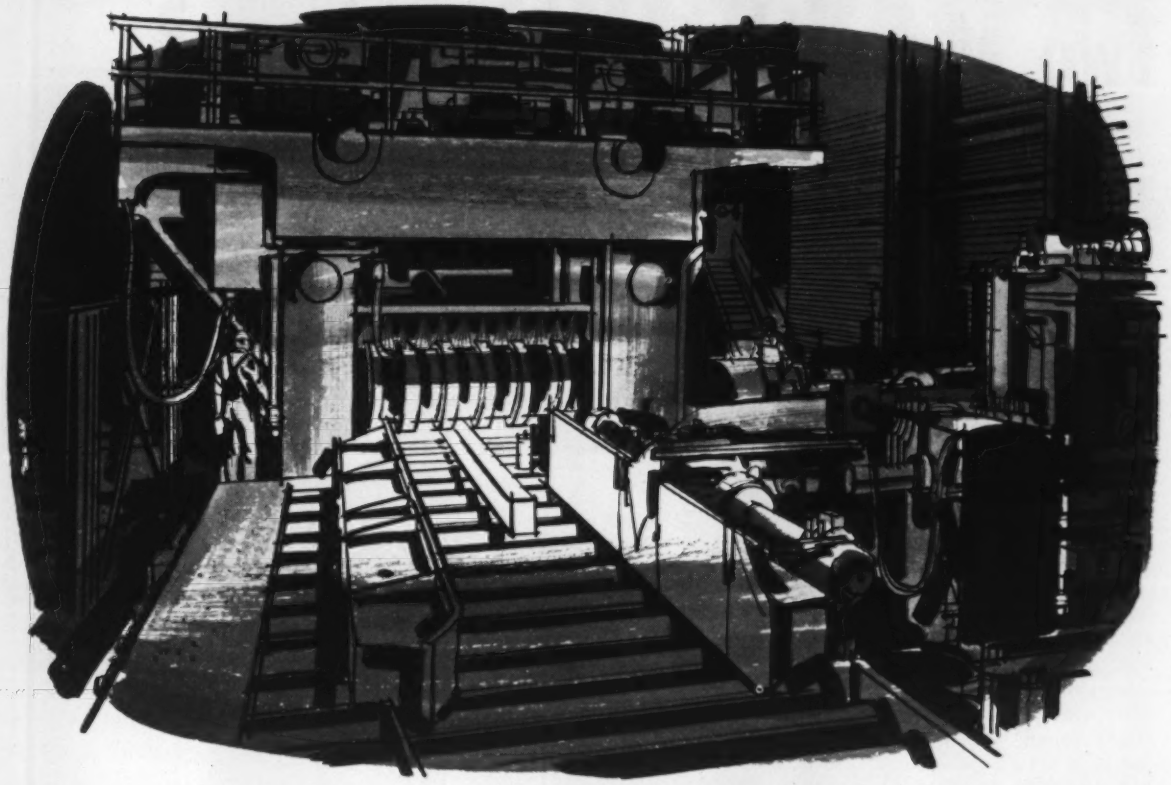
No. 1 heavy melting	31.00
No. 2 hvy melt, 2 ft & under	29.00
No. 1 bundles	31.00
No. 2 bundles	21.00
Mixed steel scrap	23.00
Mixed borings, turnings	12.00
Busheling, new factory: Prepared	31.00
Unprepared	25.00
Shovel turnings	12.00

Cast Iron Grades‡

No. 1 machinery cast	32.00

*For export add $4 dock charge.
**Based mainly on export sales.
†Nominal.
‡F.o.b. Hamilton, Ont.
§Delivered.

DANGEROUS INTRUDERS IN IRON AND STEEL SCRAP



SULPHUR . . . FRIEND OR FOE?

Sulphur is an element of several faces. As a sulphuric acid compound it occupies an important place in the steel industry where it is used for cleaning metal, the recovery of ammonia products from gas and in making chemical analyses.

As an element in the composition of steel, however, sulphur is welcome only for the free machining properties it brings to certain grades. A small percentage can more than double the speed and ease with which steel bars can be machined into gears, screws, bolts, and other small parts. There is even a free machining type of stainless steel. In these instances, sulphur serves the steel industry as a friend.

But, sulphur can be an enemy as well when it appears in the steelmaking furnace as an unknown residual element.

Sulphur makes steel hot short, meaning that it cracks and tears in rolling or forging processes. It can ruin a heat of stainless steel when its presence is unknown. Therefore, scrap, high in sulphur content, unless it is properly segregated, must be considered a foe.

For scrap of known analysis, our personnel, equipment and strategically located facilities are specifically geared for the purchase or sale of dependably segregated metals. We welcome your inquiry.

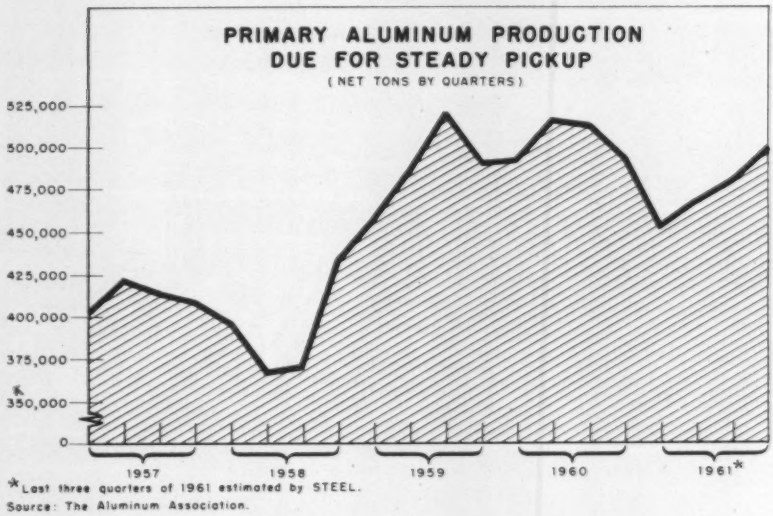
Luria Brothers and Company, Inc.

MAIN OFFICE • CHRYSLER BUILDING EAST, NEW YORK 17, N. Y.
BRANCH OFFICES • BIRMINGHAM, ALA. • BOSTON, MASS. • BUFFALO, N. Y. • CHICAGO, ILL. • CINCINNATI, OHIO • CLEVELAND, OHIO DETROIT, MICH. • GRANITE CITY, ILL. • HOUSTON, TEXAS • KOKOMO, IND. • LOS ANGELES, CAL. • MEMPHIS, TENN. • NEW YORK, N. Y. PITTSBURGH, PENNA. • PHILADELPHIA, PENNA. • PUEBLO, COLORADO • READING, PENNA. • SAN FRANCISCO, CAL. • SEATTLE, WASH. In Canada • MONTREAL, QUEBEC — HAMILTON, ONTARIO
PLANTS • READING, PENNA. • MODENA, PENNA.
FOREIGN TRADE — LURIA INTERNATIONAL DIVISION, CHRYSLER BUILDING EAST, NEW YORK, N. Y.
5950 S. BOYLE AVE., LOS ANGELES 58, CAL. • *Cable Address:* FORENTRACO

Two More Aluminum Producers?

Nonferrous Metal Prices, Page 182 & 183

TWO MORE COMPANIES may soon join the ranks of primary aluminum producers. Howe Sound Co. and Cerro Corp. are considered prime choices to become the nation's seventh and eighth producers.



*Last three quarters of 1961 estimated by STEEL.
Source: The Aluminum Association.

• **Twin Features** — The two companies have several things in common:

1. Ownership of independent aluminum fabricators that have enjoyed sales growth despite the recession.
2. Rapid growth over the last few years.
3. Wide diversification. Cerro has stayed pretty much within the metals field as a miner and refiner of lead, zinc, and copper and as a fabricator of brass mill products, wire and cable, and aluminum. Howe Sound fabricates brass, copper, and aluminum. But it also is in such fields as investment and steel castings, nondestructive testing equipment, and typewriter ribbons.
4. A good reputation and aggressive management.

• **Tipped Its Hat?**—The rumor mill has had Cerro as a prime candidate since its acquisition of United Pacific Aluminum Co., Los Angeles fabricator of bright and enameled aluminum sheet coil stock. Prior to the acquisition, United had announced it would enter the production of primary aluminum by building a 20,000-ton-a-year reduction plant at Longview, Wash. The company had an option on land near Longview and had obtained a power allocation from the Bonneville Power Authority.

Cerro's wholly owned subsidiary, Fairmont Aluminum Co., is one of the country's major independent fabricators of sheet products. Cerro is a partner in the four-company group that is building a 100,000-ton-a-year rolling mill in New York.

The company hasn't officially said it would become a primary producer, but it won't deny rumors that such a move is forthcoming.

• **Latest Candidate**—Howe Sound is the most recent possibility. Some time ago, the company was being mentioned as a candidate, mainly because of its ownership of Quaker State Metals Co., a major independent fabricator of sheet, strip, and building products. But those rumors died down until last month when the news was dropped during a routine talk before the Cleveland Society of Security Analysts. William M. Weaver Jr., president of Howe Sound, told the group that his company is considering building a reduction plant in the state of Washington.

Mr. Weaver envisions initial construction of one potline of 30,000 ton annual capacity, with eventual addition of a similar potline. The company could absorb the output of one potline now, Mr. Weaver declared. It has options on land and reports plenty of power is available.

Howe Sound makes no secret that it is looking for a partner to help finance the deal. Building a reduction plant is an expensive proposi-

(*Please turn to Page* 183)

NONFERROUS PRICE RECORD

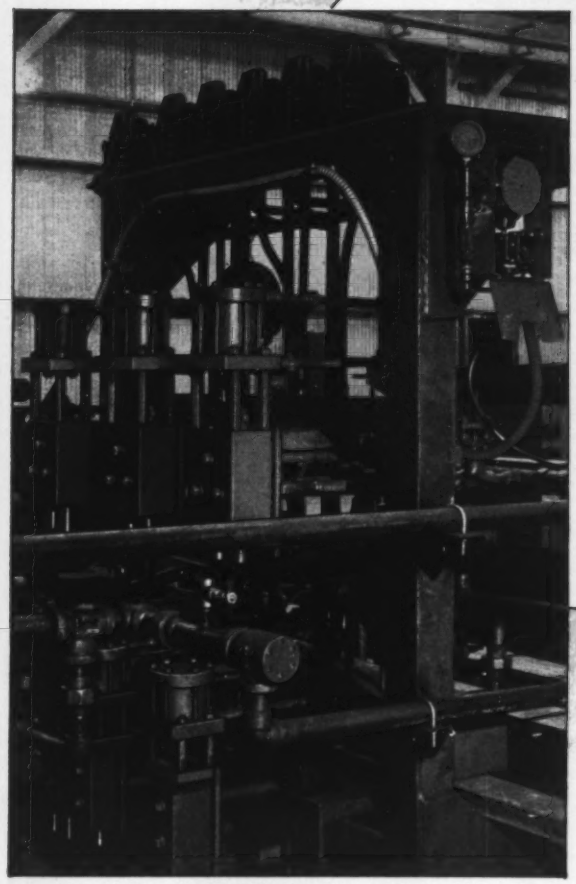
	May 3 Price	Last Change	Previous Price	Apr. Avg	Mar. Avg	May, 1960 Avg
Aluminum	26.00	Dec. 17, 1959	24.70	26.000	26.000	26.000
Copper	30.00	May 2, 1961	29.00	29.000	29.000	33.000
Lead	10.80	Dec. 13, 1960	11.80	10.800	10.800	11.800
Magnesium	35.25	Aug. 13, 1956	33.75	35.250	35.250	35.250
Nickel	74.00	Dec. 6, 1956	64.50	74.000	74.000	74.000
Tin	107.875	May 3, 1961	107.75	107.177	104.625	99.570
Zinc	11.50	Jan. 9, 1961	12.000	11.500	11.500	13.000

Quotations in cents per pound based on: COPPER, mean of primary and secondary, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, East St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingot, 99.5+%, f.o.b. customer custody; MAGNESIUM, pig, 99.8%, Velasco, Tex.

HUNT VALVES

provide around-the-clock dependability

at Granite City Steel



This valve stand in the cold strip mill is one of several key Hunt valve applications at Granite City Steel.

With Hunt valves located at many points throughout the hot and cold mills, Granite City Steel produces high quality steel, turn after turn.

Descaling, cold strip alignment, oil spraying of sheets in process . . . these are typical of the operations being controlled by Hunt hydraulic and air valves. An example is hot strip descaling where Hunt 4 in. descaling valves control 1200 psi water on a mill averaging 300 passes per hour. These valves have provided continuous, dependable service for 23 years, with minimum maintenance.

The Hunt line includes valves ranging from 1/8 through 8 in. sizes, for vacuum to 300 psi air, and for water, water soluble oil or oil to 5000 psi.

Leading steel producers consistently choose Hunt valves. Your nearby Hunt representative can tell you why. Call him today.

For more information, write for Bulletin 603. Address Hunt Valve Company, Salem, Ohio, Dept. ST-561.

HUNT

QUICK-AS-WINK© AIR AND HYDRAULIC

VALVES

HUNT VALVE COMPANY • DIVISION OF IBEC • SALEM, OHIO

3008

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99.5%, 50 lb ingots, 26.00, 30,000 lb or more, f.o.b. customer custody.

Aluminum Alloy: No. 13, 25.90;No. 43, 26.20; No. 195, 27.60; No. 214, 29.00; No. 356, 26.80, 50 lb ingots.

Antimony: R.M.M. brand, 95.5%, 32.50; Lone Star brand, 33.00, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 30.50-31.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97% lump or beads, $70.00 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $65 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.75% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 99+%, $1.50 per lb for 500-lb keg; $1.52 per lb for 100 lb case; $1.57 per lb under 100 lb.

Columbium: Powder, $55 per lb and up nom.

Copper: Electrolytic, 30.00 deld.; custom smelters, 30.00; lake, 30.00 deld.; fire refined, 29.75 deld.

Germanium: First reduction, ingots, less than 1 kg, 36.00-37.50 per gram; 1-10 kg, 30.50-32.00 per gram; 10 kg or more, 28.10-29.99 per gram; intrinsic grade, under 10 kg, 31.95 per gram; 10 kg or more, 29.95 per gram.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $70-75 per troy oz nom.

Lead: Common, 10.80; chemical, 10.90; corroding, 10.90; St. Louis, New York basis, add 0.20.

Lithium: 1 lb or 2 lb ingots, less than 24 lb, $11 per lb deld.; 24-90 lb, $9.50; 100-499 lb, $9.25; 450 lb or more, $9 per lb, delivered.

Magnesium: Pig, 35.25; ingot, 36.00 f.o.b. Velasco, Tex., 1.3 in. diam. x 12 in. sticks, 57.00 f.o.b. Madison, Ill.

Magnesium Alloy: AZ91A (diecasting), 40.75; AZ63A, AZ92A, AZ91C (sand casting), 40.75 f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $203-205 per 76 lb flask.

Molybdenum: Unalloyed forging billets, 4.125-8.5 in. diam., 50-4999 lb, $8.15 per lb, depending on quantity; 5000 lb or more, $8 per lb. f.o.b. Coldwater, Mich.

Nickel: Electrolytic cathodes, briquettes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot for addition to cast iron, in kegs, 74.50; "F" nickel, 5 lb ingots, 75.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01; Exton, Pa., basis, add 1.60. Nickel oxide sinter at Buffalo, New York, or other established U. S. ports of entry, contained nickel 69.60.

Osmium: $70-90 per troy oz nom.

Palladium: $24-26 per troy oz.

Platinum: $82-85 per troy oz from refineries.

Radium: $16-21.50 per mg radium content, depending on quantity.

Rhodium: $137-140 per troy oz.

Ruthenium: $55-60 per troy oz.

Selenium: $6.50-7 per lb, commercial grade.

Silver: Open market, 91.375 per troy oz.

Sodium: Solid pack, c.l., 19.50; l.c.l., 20.00; 5 and 12 lb bricks, c.l., 21.00; l.c.l., 21.50; tank car, 17.00.

Tantalum: Melting stock, $35 per lb; rod, $60 per lb nom; sheet, $55 per lb nom.

Tellurium: $3.50-5 per lb, 100 lb or more.

Thallium: $7.50 per lb.

Tin: Straits, N. Y., spot, 107.875; prompt, 107.75.

Titanium: Sponge, 99.3+% grade A-1, ductile (0.3% Fe max.), $1.60 per lb; grade A-2 0.5% Fe max), $1.50 per lb.

Tungsten: Powder, 98.8%, carbon reduced, 100-lb lots, $2.90 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00c; 99+% hydrogen reduced, $3.10-4.00.

Zinc: Prime western, 11.50; brass special 11.75; intermediate, 12.00. East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 12.85; special high grade, 13.00 deld. Die casting alloy ingot No. 3, 14.25; No. 2, 14.75; No. 5, 14.50 deld.

Zirconium: Reactor grade sponge, 100 lb or less, $8-8.50 per lb; 100-500 lb, $7.25-7.50 per lb; 500-1000 lb, $6.50-7.25; over 1000 lb, $6.50 per lb.

(Note: Chromium, manganese, and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 24.25-26.00; No. 12 foundry alloy (No. 2 grade), 21.75-22.25; 5% silicon alloy, 0.60 Cu max, 23.50-24.00; 13 alloy, 0.60 Cu max., 23.50-24.00; 195 alloy, 24.75-25.75; 108 alloy, 22.25-22.75. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 23.25; grade 2, 22.00; grade 3, 21.00; grade 4, 20.00.

Brass Ingot: Red brass, No. 115, 31.00; tin bronze, No. 225, 40.50; No. 245, 35.00; high leaded tin bronze, No. 305, 35.25; No. 1 yellow, No. 405, 30.50; manganese bronze No. 421, 29.75.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.25; AZ91C, 41.25; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.935, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.935, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 20,000-lb lots, 34.355; l.c.l., 34.98. Weatherproof, 20,000-lb lots, 35.55; l.c.l., 36.30.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $16.50 per cwt; pipe, full coils, $16.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheet and strip, $6.75-15.50; sheared mill plate, $5.25-9.00; wire, $5.55-9.50; forging billets, $3.20-4.75; hot-rolled and forged bars, $3.80-6.25.

ZINC

(Prices per lb, c.l., f.o.b. mill.) Sheets, 28.00; ribbon zinc in coils, 22.50; plates, 21.50.

ZIRCONIUM

Plate, $14.00-25.00; H.R. strip, $14.00-22.90; C.R. strip, $16.00-35.00; forged or H.R. bars, $11.00-17.40.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	138	120	138
Strip, C.R.	124	108	138
Plate, H.R.	130	110	126
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	200

ALUMINUM

(Selected products and sizes)

Flat Sheets: 1100, 3003, and 5005, mill finish, 30,000 lb base f.o.b. customer custody.

Thickness Range (in.)	Width (in.)	Length Range (in.)	Price Range
0.250-0.136	24-72	72-180	45.40-48.00
0.136-0.096	24-72	72-180	45.90-48.80
0.096-0.077	24-72	72-180	46.40-50.30
0.077-0.068	24-72	72-180	46.90-52.10
0.068-0.061	24-72	72-180	46.90-55.00
0.061-0.048	24-72	72-180	47.40-57.70
0.048-0.038	24-72	72-180	47.90-60.50
0.038-0.030	24-72	72-180	48.40-65.30
0.030-0.024	24-72	72-180	48.90-67.20
0.024-0.019	24-60	72-180	49.40-59.90
0.019-0.017	24-48	72-144	50.30-57.00
0.017-0.015	24-48	72-144	51.20-58.00
0.015-0.014	24-36	72-144	52.30
0.014-0.012	24-36	72-144	53.50
0.012-0.011	24-36	72-114	54.60
0.011-0.0095	24-46	72-144	56.20
0.0095-0.0085	24-36	72-96	57.50
0.0085-0.0075	24-36	72-96	59.20
0.0075-0.007	24-36	72-96	60.80
0.007-0.006	24-36	72-96	62.50

ALUMINUM (continued)

Plates and Circles: Thickness, 0.25-3 in.; width or diam., 24-60 in.; length, 72-240 in., mill finish.

Alloy	Plate Base	Circle Base
1100, 3003-F	44.60	50.90
5050-F	45.70	50.50
3004-F	46.70	52.40
5052-F	47.30	53.10
6061-T6	47.80	53.90
2024-T4*	51.80	58.90
7075-T6*	60.50	67.90

*24-48 in. width or diam., 72-180 in. lengths.

Screw Machine Stock: 30,000 base, 12 ft lengths.

Diam	Round		Hexagonal	
(in.)*	2011-T3	2017-T4	2011-T3	2017-T4
0.125	74.90	77.30	....	....
0.188	63.20	63.20	....	80.10
0.250	60.00	62.60	72.70	74.10
0.375	59.20	63.80	71.00	72.00
	2011-T3	2017-T451	2011-T3	2017-T451
0.500	59.20	63.80	71.00	72.00
0.625	59.20	63.80	67.80	67.90
0.750	57.70	62.00	61.60	63.80
0.875	57.70	62.00	61.60	63.80
1.000	57.70	62.00	61.60	63.80
1.125	55.30	59.50	59.50	61.50
1.250	55.30	59.50	59.50	61.50
1.375	55.30	59.50	59.50	61.50
1.500	55.30	59.50	59.50	61.50
1.625	53.00	56.70	....	59.30
1.750	53.00	56.70	58.30	59.30
1.875	53.00	56.70	....	59.30
2.000	53.00	56.70	58.30	59.30
2.250	51.50	55.00	....	59.30
2.500	51.50	55.00	....	59.30
2.750	49.90	53.20	....	59.30
3.000	49.00	53.20	....	59.30
3.250	....	53.20	....	....
3.375	....	53.20	....	....

*Selected sizes.

Forging Stock: Round, Class 1, random length, diam., 0.375-8 in., "F" temper; 2014, 47.50-57.60; 6061, 43.50-57.60; 7075, 61.80-71.90; 7079, 66.80-76.90.

Pipe: ASA schedule 40, alloy 6063-T6, 3-40 ft lengths, plain ends, 90,000 lb base, dollars per ft. Nominal pipe sizes: 1 in., 32.00; 1¼ in., 43.40; 1½ in., 51.80; 2 in., 62.60; 3 in., 124.95; 4 in., 171.80; 5 in., 233.15; 6 in., 308.55; 8 in., 464.35; 10 in., 716.25 (3-24 ft lengths).

Factor	Alloy 6063-T5	Alloy 6062-T6
1-14	45.30-46.80	54.00-60.00
15-17	45.30-46.80	56.50-61.80
18-23	45.80-47.50	58.60-67.60
24-32	45.80-47.50	66.80-81.50
33-38	49.50-52.20	85.10-96.60
39-44	59.80-63.60	102.00-124.00

MAGNESIUM

Sheets and Plates: AZ31B standard grades, .032 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.00 in., 67.90. AZ31B spec. grades, .032 in., 171.30; .081 in., 108.80; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Tread plate, 60-192 in. lengths, 24-72 in. widths; .125 in., 74.90; .188 in., 71.70-72.70; .25-.75 in., 70.60-71.60. Tooling plate, 0.25-3.00 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grades (AZ31B)
6-8	65.30-67.60	84.60-87.40
12-14	65.30-67.60	85.70-88.00
24-26	66.10-68.40	90.60-91.30
36-38	71.50-75.30	104.20-105.30

NONFERROUS SCRAP

DEALERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, 23.00-23.50; No. 2 heavy copper and wire, 21.75-22.25; light copper, 19.25-19.75; No. 1 composition red brass, 20.50-21.00; No. 1

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES e (Based on copper at 29.00c)		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tubes	Clean Heavy	Rod Ends	Clean Turnings
Copper	54.13b	51.36c	....	55.32	25.000	25.000	24.250
Yellow Brass	48.10	33.71d	48.39	52.26	19.250	18.375	17.375
Low Brass, 80%	50.65	50.39	50.94	54.71	21.375	21.125	20.625
Red Brass, 85%	51.54	51.48	51.83	55.60	22.250	22.000	21.500
Com. Bronze, 90%	52.98	52.92	53.27	56.79	23.000	22.750	22.250
Manganese Bronze	56.56–56.59	50.22–50.24	60.47	....	18.000	17.750	17.250
Muntz Metal	50.94	46.25	....	....	18.125	17.875	17.375
Naval Brass	52.86	46.67	59.17	57.02	18.000	17.750	17.250
Silicon Bronze	59.49	58.68	58.78	77.90	24.500	24.250	23.500
Nickel Silver, 10%	63.66	65.99	65.74	....	24.125	23.875	12.062
Phos. Bronze, A-5%	74.59	75.09	74.34	76.52	26.125	25.875	24.875

a. Cents per lb, f.o.b. mill; freight allowed on 50 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time of any or all kinds of scrap, add 1 cent per lb.

composition turnings, 19.50-20.00; new brass clippings, 17.00-17.50; light brass, 14.00-14.50; heavy yellow brass, 15.00-15.50; new brass rod ends, 16.00-16.50; auto radiators, unsweated, 15.25-15.75; cocks and faucets, 17.00-17.50; brass pipe, 17.50-18.00.

Lead: Soft scrap lead, 7.25-7.75; battery plates, 3.00-3.25; linotype and stereotype, 8.00-8.25; electrotype, 7.50-7.75; mixed babbitt, 9.50-10.00.

Monel: Clippings, 23.00-23.50; old sheets, 22.00-23.00; turnings, 16.50-17.00; rods, 22.00-23.00.

Nickel: Sheets and clips, 52.00-54.00; rolled anodes, 52.00-54.00; turnings, 40.00; rod ends, 52.00-54.00.

Zinc: Old zinc, 3.50-4.00; new diecast scrap, 3.50-4.00; old diecast scrap, 1.75-2.00.

Aluminum: Old castings and sheets, 9.75-10.25; clean borings and turnings, 4.50-5.00; segregated low copper clips, 11.75-12.25; segregated high copper clips, 10.75-11.25; mixed low copper clips, 11.25-11.75; mixed high copper clips, 10.75-11.25.

(Cents per pound, Chicago)

Aluminum: Old castings and sheets, 9.75-10.25; clean borings and turnings, 7.00-7.50; segregated low copper clips, 15.00-15.50; segregated high copper clips, 13.00-13.50; mixed low copper clips, 12.50-13.00; mixed high copper clips, 12.00-12.50.

(Cents per pound, Cleveland)

Aluminum: Old castings and sheets, 11.00; clean borings and turnings, 9.00-9.50; segregated low copper clips, 14.00; segregated high copper clips, 13.50; mixed low copper clips, 13.50; mixed high copper clips, 13.00-13.50.

REFINER'S BUYING PRICES

(Cents per pound, carlots, delivered refinery)
Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 56.00; light scrap, 51.00; turnings and borings, 36.00.

Copper and Brass: No. 1 heavy copper and wire, 27.50; No. 2 heavy copper and wire, 25.50; light copper, 23.25; refinery brass (60% copper) dry copper content, 24.25.

INGOTMAKERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, 27.50; No. 2 heavy copper and wire, 25.50; light copper, 23.25; No. 1 composition borings, 22.50; No. 1 composition solids, 23.00; heavy yellow brass solids, 17.00-17.50; yellow brass turnings, 16.00-16.50; radiators, 18.00-18.25.

Plating Material

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.60.

Copper: Flat-rolled, 47.04; oval, 43.50; electrodeposited, 39.00; cast, 41.50; 5000-10,000 lb quantities.

Nickel: Depolarized, less than 500 lb, 109.00; 500-1999 lb, 102.00; 2000-4999 lb, 98.50; 5000-29,999 lb, 97.50; 30,000 lb, 96.50. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 126.50; 200-499 lb, 125.00; 500-999 lb, 124.50; 1000 lb or more, 124.00.

Zinc: Balls, 18.75; flat tops, 18.75; flats 21.50; ovals, 20.75, ton lots.

CHEMICALS

Cadmium Oxide: $1.60 per lb in 100-lb drums.

Chromic Acid (flake): 100-2000 lb, 31.00; 2000-10,000 lb, 30.50; 10,000-20,000 lb, 30.00; 20,000 lb or more, 29.50.

Copper Cyanide: 100-200 lb, 65.90; 300-900 lb, 63.00; 1000-19,000 lb, 61.90.

Copper Sulphate: 100-1900 lb, 15.00; 2000-5900 lb, 13.00; 6000-11,900 lb, 12.75; 12,000-22,900 lb, 12.50; 23,000 lb or more, 12.00.

Nickel-Chloride: 100 lb, 45.00; 200 lb, 43.00; 300 lb, 42.00; 400-4900 lb, 40.00; 500-9900 lb, 38.00; 10,000 lb or more, 37.00.

Nickel Sulphate: 5000-22,999 lb, 29.00; 23,000-39,900 lb, 28.50; 40,000 lb or more, 28.00.

Sodium Cyanide (Cyanobrik): 2000 lb, 23.80; 400-900 lb, 20.80; 1000-4900 lb, 19.80; 5000-19,900 lb, 18.80; 20,000 lb or more, 17.60.

Sodium Stannate: Less than 100 lb, 82.80; 100-600 lb, 73.20; 700-1900 lb, 70.40; 2000-9900 lb, 68.50; 10,000 lb or more, 67.20.

Stannous Chloride (Anhydrous): 25 lb, 158.70; 100 lb, 153.80; 400 lb, 151.40; 800-19,900 lb, 110.50; 20,000 lb or more, 104.40.

Stannous Sulphate: Less than 50 lb, 143.60; 50 lb, 113.60; 100-1900 lb, 111.60; 2000 lb or more, 109.60.

Zinc Cyanide: 100-200 lb, 59.00; 300-900 lb, 57.00.

(*Continued from Page 180*)

tion, and lending institutions reportedly aren't eager to invest funds in such a move because of the low return on capital investment.

• **The Lure**—Why are companies interested in becoming integrated producers when annual capacity is more than 2.4 million tons and production is running at a rate of around 1.9 million tons? (See graph, Page 180.) There are two reasons:

1. The most profitable item in aluminum today is pig, not mill products. 2. Predictions are that the current gap between supply and demand won't last much longer.

The industry is much more optimistic about 1961 than it was earlier. Sales are going up; customers seem to be more optimistic than they were; and user inventories are lower.

Why Copper Price Went Up

The price of copper went up 1 cent a pound last week (May 2) to 30 cents, and many people not close to the industry are asking why. At least four good reasons are evident:

1. Heavy Japanese buying of U. S. scrap made the scrap situation in this country tight. What scrap was available was high priced, so custom smelters had to withdraw from the market for all practical purposes.

2. The London Metal Exchange price had been going up because of good European demand and continued uncertainty about political developments in Africa.

3. Primary producers in the U. S. are pretty much sold out through May because of better domestic demand. April demand was better than March's, and May's will be even better than April's.

4. There is the possibility of a strike at U. S. properties of Kennecott Copper Corp. this summer.

It's possible the price could go up another cent a pound over the next few weeks, insiders believe. They point out that not much more copper will be available at 30 cents than at 29 cents. At a higher price, it becomes more attractive for smelters to dispose of their stocks.

Scrap . . .

(*Concluded from Page 177*)

is quoted by brokers at $30-$31. The downward move was anticipated a week ago. Two district mills have entered the market at the lower level, both seeking normal tonnage for May shipment.

• **St. Louis**—The market is weak, and the outlook is dim. Buyers aren't pressing dealers for tonnage despite rising steelmaking operations. The reason: Steel mills are using more hot metal in their melts. Also, demand for scrap on export account has eased.

• **Birmingham**—The market is easy here, and prices have been marked down $1 to $4 a ton. Dealers say the downtrend reflects what's happening to export demand; prices in that trade have fallen $4 a ton since Apr. 1. Two vessels were loaded last week at Mobile for shipment of 22,000 tons to Japan. One cargo is made up completely of No. 2 bundles.

A large producer of cast iron pipe is expected to enter the market shortly for substantial tonnages of plates and structural scrap. Inquiries are out for fair tonnages of electric furnace bundles.

• **Houston** — Dealers report steel scrap prices are off about $3 a ton, but published lists are nominal in the absence of representative purchases. Export prices are down $3-$4 a ton from the early April peak. In Baton Rouge and New Orleans, La., sporadic quotations were $39-

CLASSIFIED

WANTED

Direct Arc, Tilting Furnace, shell diameter 13 to 15 feet top charge, with 10,000 to 12,000 KVA furnace transformer, primary voltage 13,200. Must be in good condition.

Address **P.O. Box No. 368, Niagara Falls, New York,** advising complete description, price, and location.

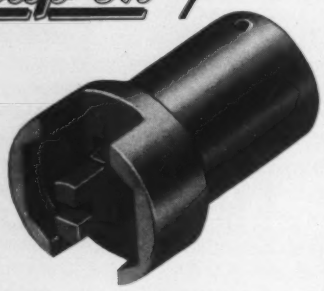
WE CAN HELP YOU TO CONTACT high calibre men to fill specific jobs you have in mind.

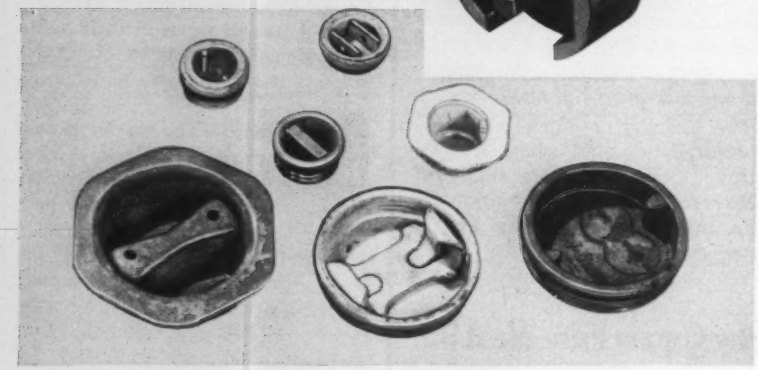
Readers of STEEL include men of wide training and experience in the various branches of the metalworking industry. When you have an opportunity to offer, use the Help Wanted columns of STEEL.

Another Tool Answer

by Snap-on

New Bung Starter Socket





Got a tough tool problem? Try SNAP-ON for the solution. Take this new SNAP-ON bung starter socket, for example. It fits practically any bung you'll find — on grease and oil drums; containers for chemicals, solvents, etc. It eliminates wasted time, damage to bungs and drums, and the skinned knuckles you get with makeshift tools. This socket will pay for itself over and over.

Fits every bung we've tried

The above photo is typical. Bungs come in a wide variety of sizes and types with many different styles and shapes of turning flanges. This socket handles every one we've checked.

Use this bung starter socket with any ½-inch drive wrench handle or impact wrench. Order a supply from your SNAP-ON representative. He will be happy to serve you for any of your tool requirements — work with you on tool-use problems, or place at your disposal SNAP-ON's creative engineering service. He's a hand tool specialist with wide experience. Call your nearest SNAP-ON branch or write us.

Here a worker removes a bung quickly, easily. Socket fits around the outside circumference of small bungs, the inside circumference of large bungs, enabling the specially shaped housing or spring-loaded tongue to engage the various bungs.

FOR ALL INDUSTRY

SNAP-ON TOOLS

Railroad Division

8121-E 28th AVENUE • KENOSHA, WISCONSIN

$40 for No. 1 heavy melting last week, with No. 2 heavy melting $36, and No. 2 bundles $26.

• **San Francisco** — Weakness persists in this market, and it's expected that price declines of $2 to $3 a ton will be marked up on the top grades shortly. The current price structure is based on export sales.

• **Los Angeles**—Dealers are anticipating resurgence of mill demand this month if the softening in prices continues. The mills have been increasing operations and have reduced their scrap inventories to the point they'll have to begin replenishing stocks soon.

• **Seattle**—The market is fairly active, and prices are steady. Ample supplies are arriving at tidewater where exporters are assembling large tonnages for shipment to Japan. Freight rates to the Orient are steady, averaging $80,000 for a 9000 ton, full cargo, free loading and discharge.

User Scrap Stocks Drop Seven Straight Months

Although domestic consumption of ferrous scrap in February dropped 3 per cent under the January total, 3,930,000 gross tons vs. 4,059,361, the daily consumption rate during the month increased 7 per cent because of fewer working days. The total charge of scrap and pig iron during the month (7,544,000 gross tons) consisted of 52 per cent scrap and 48 per cent pig iron, unchanged from January.

Stocks of domestic consumers on Feb. 28 were 3 per cent lower than they were on Jan. 31. It was the seventh consecutive monthly decline reported by the Bureau of Mines. Stocks of pig iron were off 2 per cent in the month.

Home scrap produced in February accounted for 2,238,000 tons, slightly less than in January. Purchased scrap received by consumers totaled 1,436,000 tons, 2 per cent less than in the preceding month. Of the purchased material, 84 per cent came from dealers, and 16 per cent from other sources.

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May 15

IN

STEEL

A Guide to Tool Steels & Carbides

The editors will present a directory to more than 1200 different tooling materials, including tool steels, carbides, and the relatively new ceramics. The information covers 79 major suppliers.

The 48 page Guide takes on major importance this year, as tool materials are awarded more and more structural jobs, in addition to their traditional tooling applications.

The Guide will help you find a material, help you evaluate it in terms of your process or product requirements, and help you find a supplier.

Don't miss the 1961 edition of the Guide to Tool Steels & Carbides in next week's issue.

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these Debentures. The offer is made only by the Prospectus.

$300,000,000

United States Steel Corporation

4½% Sinking Fund Debentures Due 1986

Dated April 15, 1961 *Due April 15, 1986*

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Price 99¼% and Accrued Interest

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Bigger results with ROTOBLAST!

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Try Rotoblast abrasives, too!

A special heat-treating process makes Rotoblast Steel Shot and Grit solid, tough, able to take more punishment than ordinary abrasives. Because they are *extra* tough, Rotoblast abrasives last longer, work harder and lower your replenishing costs. We'll be glad to go into more detail. Just write:

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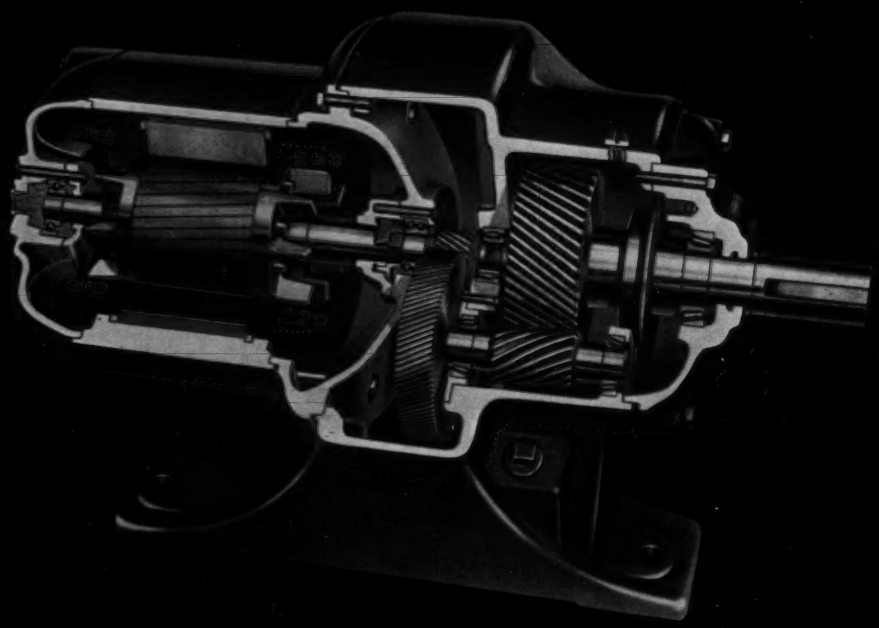

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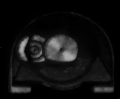

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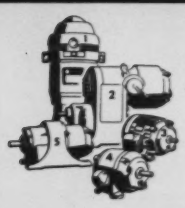

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